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[Continued from Supplement No. 127, page 2022.]

THE ART OF PRESERVING THE EYE-SIGHT.

III.—The Ophthalmoscope.

As we shall have occasion very often, during our remarks on the various affections to which the eye is subject, to speak of the *ophthalmoscope*, we will here describe the apparatus, and the mode of using it. Before doing this, however, we must discuss the fact of the dark appearance generally presented by the pupil.

The amount of light reflected by the background of the pupil cannot, of course, be very great, for the retina alone is able to reflect light, and as it is very transparent, and has, moreover, a dark layer of pigment immediately behind it, which absorbs all the light that has penetrated to it, the reflection must necessarily be weak. We know how difficult it is to see through a window into a room from the street. This is due to the small amount of light which comes through the window, in comparison to that which penetrates the eye from without, so that the eye is not sufficiently sensitive to perceive the weaker impression; moreover, the reflection from the panes of glass considerably increases the difficulty of perceiving objects in the interior of the room. If, however, the room is lighted up at night, we can see the interior very distinctly from the outside, although the illumination of the interior is weaker than it was in the daytime.

Fig. 35.—SPECTACLES FOR MYDRIASIS.

These circumstances also apply to the eye; but there is another, which adds to the difficulty of examining the interior of the eye. The same fact makes it impossible to see the background of a camera-obscura through the lens, even when it is white. According to the laws of refraction, both the incident and emergent rays in the eye, or in a camera-obscura, have a fixed direction, while the light which proceeds from a room through the window is diffused—that is to say, emits rays in all directions. Let us suppose the image of a lighted candle to be thrown upon the retina; then, as far as the refracting media of the eye are concerned, this image may be regarded as a second object, the rays from which will take an outward and therefore opposite direction. Now, this will be precisely the same as the path of the incident rays; for if, at the point where an image of an object has been formed by a lens, we place an exactly similar object instead of the image, then an image will be formed in the exact position of the first object, and of equal size. We see from this experiment, therefore, that the rays of light which are emitted by an image formed upon the retina must return to the object from which they originally proceeded.

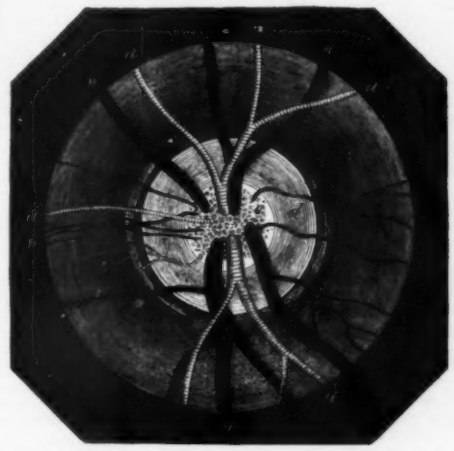


Fig. 28.—THE RETINA OF A NORMAL EYE, AS SEEN BY THE OPHTHALMOSCOPE.
a, a. Arteries. *v, v.* Veins.

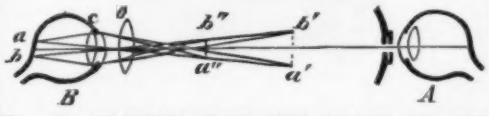


Fig. 27.—SHOWING HOW THE IMAGE OF THE BACK OF THE EYE IS PRODUCED.

Fig. 30.—THE HAND OPHTHALMOSCOPE.

If, therefore, a light is placed before any eye which we wish to examine, the rays will all be reflected by the eye into the light, and we are unable to intercept them by our own eye, because we should hide the light by placing ourselves between it and the eye under examination. To obviate this the instrument called the *ophthalmoscope* was invented by Prof. Helmholz, in 1851. (Fig. 26.) This consists: 1. Of a concave spherical reflector of glass or metal, M, in the middle of which is a small hole about one-sixth of an inch in diameter. The focal length of the reflector is from 8 to 10 inches. 2. Of a converging achromatic lens, *o*, which is held in front of the eye of the patient. 3. Of several lenses, some convergent, others divergent, any one of which can be

Fig. 31.
THE FIXED OPHTHALMOSCOPE.

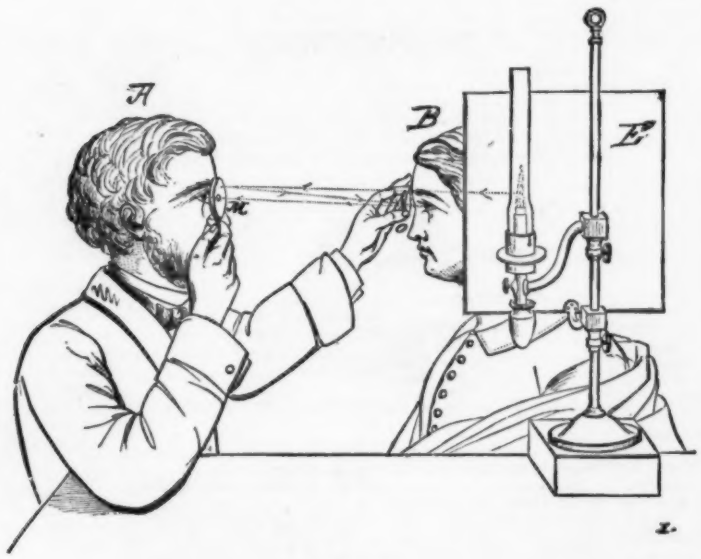


Fig. 26.
THE OPHTHALMOSCOPE.

Fig. 32.—THE ACHROMATIC OPHTHALMOSCOPE.
a, The instrument. *b* and *c*, Sections of lenses, showing the arrangement of the flint and crown glass.

Fig. 33.—"LOUCHETTES," FOR STRABISM.

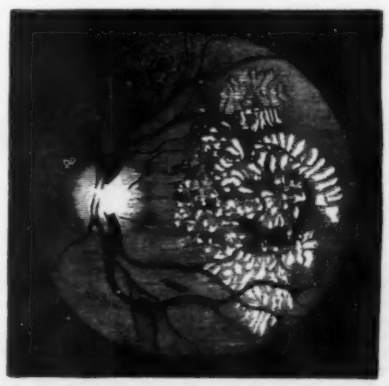


Fig. 29.—THE RETINA OF A DISEASED EYE.

fixed in a frame behind the mirror, so as to correct any given imperfection in the observer's sight. If the mirror is of silvered glass it is not necessary that it be pierced in the center; it is sufficient that the silvering at the center be removed.

Fig. 34.—SPECTACLES FOR "CROSS-EYE."

To make use of the ophthalmoscope, the patient is placed in a darkened room, and a lamp, furnished with a screen, E, put beside him. The screen serves to shade the light from his head and keep it in darkness. The observer, A, holding in one hand the reflector, M, employs it to concentrate the

light of the lamp near the eye of the patient, B, and with his other hand holds the achromatic lens, *o*, in front of the eye. By this arrangement the back of the eye is lighted up, and its structure can be clearly discerned. Fig. 27 shows how the image of the back of the eye is produced, which the observer, A, sees on looking through the hole in the reflector. Let *a b* be the part of the retina on which the light is concentrated, pencils of rays proceeding from *a b* would form an inverted and aerial image of *a b* at *a' b'*. These pencils, however, on leaving the eye, pass through the lens, *o*, and thus the image *a' b'* is in fact formed, inverted, but distinct, and in a position fit for vision. The great quantity of light concentrated by the ophthalmoscope is apt to painfully irritate the eye of the patient. There are, therefore, interposed between the lamp and the reflector colored glasses, to cut off the irritating rays, viz., the red, yellow and violet. The glasses generally used are tinted green or cobalt blue. In the majority of cases the eye is examined without any previous preparation, but it sometimes happens that we are obliged to dilate the pupil; in such cases we use a solution of belladonna, which has the property of paralyzing the circular fibers of the iris. A few drops of this injected into the eye produce, in a few moments, the dilation (*mydriasis*) necessary for the examination.

We are now in a position, with the aid of the ophthalmoscope, to make a thorough examination of the retina. Fig. 28 gives a tolerable representation of all that we are able to distinguish of the image in the normal eye. The background of the whole is of a dull red, while the point where the optic nerve enters is distinguished as a round bright spot, and we may see rising out of its midst the retinal vessels, arteries, *a a*, and veins, *b b*, which extend over the entire retina.

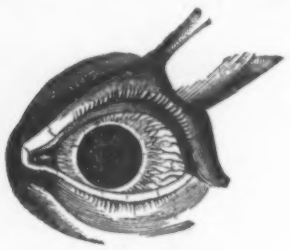


FIG. 36.—IRITIS.

Fig. 29 represents one of the alterations of the back of the eye examined by the aid of the ophthalmoscope. These consist of choroidal exudations, with pigmentary spots. This figure will serve to show an example of some of the disorders that exist in certain diseases of the eye. The ophthalmoscope has become an instrument of incalculable value to the oculist. Many changes in the interior of the eye which are due to disease can be observed and examined by means of this instrument; and, in fact, the medical treatment of the eye has made an immense advance since its discovery.

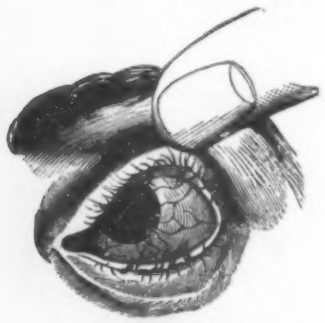


FIG. 37.—TRICHIASIS. Inversion of the Lids

The hand ophthalmoscope, which is the form of the instrument most generally used and the one that we have just described, is represented in Fig. 30.

Doctors Follin, Cusco and Liebrich have also devised a form of the instrument called the "fixed ophthalmoscope." This is very convenient for a prolonged examination of the eye. One of these is represented at Fig. 31.

As we have seen, the lenses employed in the ophthalmoscope are simple spectacle glasses, which give a tolerable definition, but which have the great defect of changing the tint of objects through chromatic aberration; for this reason achromatic lenses have been substituted for the simple ones, and an *achromatic ophthalmoscope* thus formed. One of these instruments, thus modified, is represented at Fig 32.

FIG. 38.—ALBUGO OF THE CORNEA.

IV.—THE MALADIES OF THE VISUAL ORGAN—MEANS OF REMEDYING THEM.

Thousands of causes may bring about visual troubles, and various names have been given to the affections which result therefrom. We will examine them, and then we will take occasion to describe those which are most interesting.

Thus in *amaurosis* the eye-sight will be gradually extinguished if at its inception care be not taken to arrest it by therapeutical treatment. In certain cases the eye presents grave interior disorders, and yet vision is little changed. At other times no pathological disorders are seen, and vision becomes almost instantaneously null (*asthenopia*). The most common visual trouble is that which prevents a person from seeing distant objects, but permits him to see those which are near by (*myopia*); or, indeed, that of which the effects are just the contrary (*presbyopia*). Often vertical lines are seen clearly, while horizontal ones are dim, or *vice versa* (*astigmatism*).

It may happen, too, that one portion of a body is seen more clearly than another (*meropia*); or, again, that one part of an object only is clearly seen, the other being covered with a dark vail (*hemiopia*). Often, in certain paralyses of the retina, objects can be seen only by inclining the head; often, too, a bar seems to hide everything. The eyes are occasionally different, and this trouble is known as *assymetropia*. Sometimes spots are seen, stationary with regard to the visual axis (*scotopsia*); now these spots are seen moving or flying (*muscæ volitantes* of physicians), as it happens at the beginning of cataract; now, again, these bodies that are seen are luminous (*photopsia*). When light fatigues and irritates the eyes, the affection is designated as *photophobia;* and when bright light facilitates vision, it is called *photolimia*.

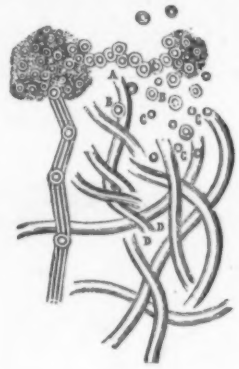


FIG. 39.
MUSCÆ VOLITANTES. "FLYING INSECTS."

FIG. 40.
PTERIGION. THICKENING OF THE CORNEA.

Objects may also be seen of some other color than that they really possess; this is known as *chrupsia*. They may also appear as if they were seen through a lattice work ("reticulate vision," *visus reticulosus*). Sometimes objects appear distorted. Often vision is double; or, again, multiple. Objects may also be seen larger or smaller than they really are. Often a person cannot judge of colors; this is known as *daltonism*. All these various affections of the eye-sight happen in the course of certain maladies, or under certain circumstances for which it is necessary to have recourse to the most experienced physicians.

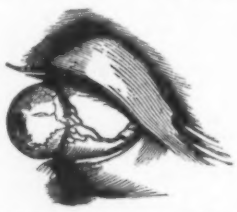


FIG. 41.—STAPHYLOMA OF THE CORNEA.

Strabismus, or "squint-eye," is due to a want of harmony in the visual axes; so that if a person thus afflicted wishes to look at anything, one of his eyes takes a direction contrary to that which it ought. Here we have a case of *simple strabismus;* but if it happen that, while the eyes are open, the deviation takes place in one rather than the other, according as the patient uses this or that eye, the *strabismus* is called alternate. The *strabismus* may be convergent, or directed toward the nose ("cross-eye"), or divergent, when the eye is turned outward ("wall-eye"); frontal, when the eye is turned upward; inferior, when it is turned downward; there has been seen also, but rarely, "*horrible strabismus*," in which one of the eyeballs is drawn toward the forehead and the other toward the cheek. The causes of strabismus are very numerous, so we cannot examine them here. The treatment consists in the use of *louchettes* (Fig. 33), and appropriate exercise in connection with medicines, or in an operation.

FIG. 42.—SCLAROTITIS.

Spectacles specially adapted for strabismus have also been devised. Thus, if it is desired to correct a convergent strabismus of the right eye, the left eye is masked with a black glass, A (Fig. 34), and half of the right glass is blackened, as figured at B (Fig. 34). In this way the eye is compelled to look outward. This tension may, in young subjects, especially at the commencement of a slight strabismus, improve the condition of the affected eye. But this trouble always needs the attention of a skilled oculist.

In "diplopy" two objects are seen instead of one. We distinguish "binocular diplopy" when two objects are seen with the two eyes, and "uniocular diplopy" when two objects are perceived with a single eye. This trouble arises from a paralysis of one of the muscles of the eye. It is treated with the aid of medicaments and the use of prismatic glasses.

Mydriasis is an exaggerated and permanent dilation of the pupil. This affection may require medical treatment, combined sometimes with the use of spectacles, composed of blackened disks, pierced with a small hole (Fig. 35), which renders the eye-sight clear. An affection just the opposite—the pupil being contracted to an exaggerated degree—is called *myosis*.

We will now indicate some of the more interesting maladies of the eyes.

"Hemeralopy" is a strange disease, owing to which the patient can see well only during the daytime. It is an affection of the retina, and the causes that produce it are dwelling in damp places, in the neighborhood of marshes, exposure to too bright a light, etc. "Nyctalopy" is just the opposite, for here the eye-sight is null during the day, while it is quite perfect at night. In this disease it often happens that the patient can read in the dark, and that the light of a single candle cannot be endured. Colored glasses may be used in this affection. The disease arises from inflammation of the retina.

FIG. 43.—CONE-SHAPED CORNEA.

Achromatism, or "Daltonism," is a singular disease, in which colors cannot be distinguished. It is also called "color-blindness."

Iritis (Fig. 36) is an inflammation of the iris, and nothing can be more painful; the light cannot be borne without the most fearful torture. The iris changes color; if blue, it becomes green; if brown, it becomes reddish; in some cases the vessels of the conjunctiva and sclerotic are obstructed, and then it becomes quite grave.

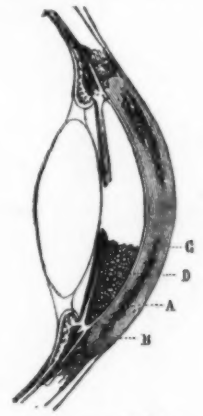


FIG. 44.—ONYX.
A.—Pus between the layers of the Cornea. B and C.—Its limits. D.—Pus in the anterior chamber.

Ophthalmia is an inflammation of the conjunctiva. According to its aspect, it is designated as "simple," "pustular," "granular," or "purulent" conjunctiva. The first is a slight affection and readily cedes to medicine. In the second, besides a redness, there is seen near the edge of the cornea a small pustule, into which the injected vessels empty. In the third, granulations form under the eyelids, sometimes in such numbers as to raise the lids in a notable manner. Purulent conjunctiva is common to children. A current of cold air may determine this horrible affection in a newly-born babe, and if care be not taken the eye-sight may be forever lost.

FIG. 45.—PERFORATED CORNEA.

A trouble which often causes fright, but which really amounts to nothing since it cedes to fresh-water lotions, is *ecchymosis* of the conjunctiva, in which the vessels are injected, and acquire a bright red tint.

Blepharitis consists of an inflammation of the Meibomian glands; the borders of the eyelids are red; the eyes are glued together in the morning, and there is smarting and itching. It is important to remove the scabs to prevent the loss of the eyelashes. At night poultices of rice flour should be applied, and the eyes washed seven or eight times a day with the following eye-wash:

Borax	3 grains.
Water	3 ounces.
Mix.	

When the affection begins to disappear a little simple ointment may be applied.

Trichiasis (Fig. 37) is a turning of the eyelids inward; it may lead to stubborn inflammation, and often to *chalazion*,

which is a swelling of the fallicles of the palpebral cartilage. "Films" on the cornea may often form after inflammation. When the eye-sight is weak a cloud may exist; then the "film" is simple. If the "film" is opaque (Fig. 38) it is named *albugo*. When the opacity is complete it is called *leucoma*. In this disease a peculiar form of spectacles is used, which serves to limit the places that remain transparent; in this way the eye-sight is made more perfect.

The "senile circle," or *gerontoxon*, is an opaque circle found on the cornea, toward the sclerotic. This opacity occurs with aged persons, and does not injure vision.

"Hemiopy" is a singular affection, in which only half of an object can be seen. It is curable if the precaution be taken to consult a doctor in time.

Muscæ volitantes (*myodepsia*, "flying insects") is a trouble that affects a great many persons. Filaments and dots swim before the eyes, changing form and moving whenever the latter are turned. This trouble is sometimes caused by small bodies in the liquids of the eye and sometimes by congestion of the retinal vessels. The patient should refrain from all exciting causes, such as abuse of the eyes, excesses of all kinds, sitting up late, and the use of alcohol in any form or in any quantity. The only remedy is continuous rest for the eyes. In this way certain persons have been entirely cured.

Pterigion (Fig. 40) is a thickening of the conjunctiva, which may destroy the eye-sight by spreading over the cornea.

Staphyloma is a tumor situated under the conjunctiva, at the anterior or posterior part of the eyeball. There is also a *staphyloma* of the cornea (Fig. 41). There may exist *staphyloma* of the sclerotic, called *sclerotitis* (Fig. 42). In abscess of the cornea there often forms a deposit of pus in the anterior chamber (*hypopion*) (Fig. 44). The cornea may also be perforated, as seen at A (Fig. 45).

We may state likewise that animals sometimes develop in the eye; as, for instance, the *cysticercus* of the vitreous humor, which has often been figured by scientists.

In regard to diseases of the eye, there may be considered two distinct kinds of treatment—the *optical* and the *medical*. The former appertains to the oculist and the optician; the latter to the physician entirely. Too great care, then, cannot be taken in the choice of the optician and physician.

KOUMISS; ITS MODE OF PREPARATION AND ITS REMEDIAL VALUE.

By WILLIAM PEPPER, M.D., Professor of Clinical Medicine in the University of Pennsylvania.

DESPITE the marked advances made of late years in our knowledge of the alimentation proper for different kinds of disease, we are constantly meeting with special conditions in which it is very difficult to find any form of food that will agree with the patient. The introduction of the exclusive milk diet, now so well established, has put into our hands a most valuable mode of treatment in a number of obstinate and intractable affections.

Not only in gastralgia and some other forms of dyspepsia, and in chronic diarrhea, but in organic disease of the kidneys, and in certain types of cardiac disease, and in some nervous affections, does the administration of milk, according to a definite method, prove an invaluable mode of treatment. In cases of malnutrition or wasting disease, where it is desired to give more food than can be advantageously taken in a solid form, milk has been found the best addition to the diet. It will be found, however, that in certain cases of all these groups milk is not well digested. No doubt the assurance so often given to us that milk cannot be taken is, for the most part, unfounded. But I have frequently met with cases where very careful trials convinced me that the statement was literally true; and, unfortunately, in not a few instances this has happened in the very cases where I was most desirous either of using an exclusive milk diet or of giving a considerable amount of milk to eke out the insufficient quantity of solid food that could alone be digested. In these cases I have found very great advantage in resorting to koumiss as a substitute for milk. I have also found that this new article of diet is peculiarly applicable in certain conditions where milk is not specially indicated.

Before illustrating these statements by the brief notes of a few of the many cases in which I have used koumiss with advantage, a short account of this useful food may be given. It is essentially milk in which alcoholic fermentation has been induced, and allowed to proceed to a moderate degree. In Tartary, where it has been extensively used for centuries, mare's milk is employed; while in Russia, according to Liebig, cow's milk is chiefly used in its preparation. I am satisfied that koumiss made from cow's milk is quite as good as that made from the milk of mares or of camels. It has also been supposed that some special ferment used in Tartary was more efficient than any other, but I believe that ordinary brewer's yeast answers the purpose equally well.

As koumiss will not bear transportation to any considerable distance, it is desirable that the mode of preparing it should be generally known. I have therefore requested Mr. George I. McKelway, of Philadelphia, who has supplied me with all the koumiss my patients have used, to give the formula for its preparation. He writes as follows: "The manufacture of koumiss is a very easy and simple process. I take—

℞. Best unskimmed milk ..... qt.j
Yeast (brewer's or old baker's)..... ... grs.c
Cane sugar .... grs.cc

"Keep the mixture at a temperature of 80° Fahr. until fermentation is quite brisk, stirring it frequently, and then bottle, carefully securing the corks with strong twine or wire. After twenty-four hours it is fit for use.

"The object of the addition of the cane sugar is the certain induction of alcoholic formentation. If the sugar be left out the result is likely to be that lactic fermentation only is set up, and the product is sour milk. The quantity of sugar used has, of course, to be judged by the richness of the milk and its consequent richness in fermentable constituents."

The koumiss thus prepared by Mr. McKelway has proved entirely satisfactory. It is a very agreeable drink, having a slightly acid taste, and containing from three to four per cent. of alcohol, one to two per cent. of lactic acid, and is highly charged with carbonic acid gas. It contains the ordinary ingredients of milk, with the exception of the lactose (sugar of milk), most of which is converted into alcohol and lactic and carbonic acids. Koumiss is acid to litmus paper, both before and after being freed from carbonic acid. Its specific gravity is rather less than that of the milk from which it has been made (1·040 instead of 1·043). As it is important to retain its effervescing character, it should always be drawn by means of a "champagne tap." It should be used within a few days of its preparation, since after two or three days the alcohol and lactic and carbonic acids increase so as to make it less agreeable and less well adapted to most cases. It should be kept on ice, or in a very cool place, as warmth soon causes the caseine to separate into a thick, heavy curd. Koumiss may be said, then, to fairly represent the nutritive properties of good milk, while possessing, in addition, a mildly stimulating character. The carbonic acid gas, with which it is highly charged, acts also as a sedative to the gastric mucous membrane, and thus renders it well adapted to cases where there is much irritability of stomach.

I have used koumiss both as an exclusive diet and as an addition to an ordinary diet. In the former case the amount taken has been, at first, two or three fluid ounces every two hours; then, in the course of a couple of days, four fluid ounces every two hours; then six fluid ounces every three hours; and finally half a pint every three hours, or two quarts in the course of a day and night. This total I have rarely exceeded, though in a few instances as much as three quarts have been taken, in divided doses. Usually, by the time two quarts had been taken daily for a short time, it has proved both possible and desirable to associate with it some simple solid food. When used as an addition to an ordinary diet, I have given it to the extent of one quart daily, in doses of half a pint in intervals between meals. Formerly the high cost of this article was a serious objection to a prolonged use of it in large quantities, but now that it can be had at the rate of one dollar for three quart bottles, this objection has been largely done away with. I see no reason, however, why koumiss should not be made according to the above receipt, by any one who finds it inconvenient to obtain it from some of the recognized manufacturers, of whom there are several in Philadelphia and New York, if not elsewhere.

I must be brief in alluding to the conditions in which I have found its use most beneficial, among which may be first mentioned catarrhal phthisis. In this form of pulmonary disease, which, in this climate, is by far the most frequent variety of so-called consumption, the pulmonary trouble is often complicated with gastro-hepatic catarrh, either in a subacute form or in the form of acute attacks recurring at irregular intervals. I think that all careful observers must have noticed how frequently in such cases milk disagrees and oil cannot be taken. The difficulty of getting these patients to digest a sufficient amount of nourishing, fat-making food is, indeed, one of the most serious points in their treatment. I can confidently advise the use of koumiss in this condition. The patient can usually make three light and simple meals, and in addition half a pint of koumiss can be taken early in the morning, between breakfast and dinner, between dinner and supper, and toward bedtime. A special advantage to be here noted is that when taken at night it not only agrees well, but exerts a mild soporific influence. It is probable that the high reputation enjoyed by koumiss as a remedy for phthisis in some distant parts of the world is due to its excellent action in many cases of the class I have alluded to.

As an illustration of another condition not rarely met with in phthisical patients, I may quote the case of T. W., aged 24, who applied to me with extensive disseminated disease in the left lung, with a glazed, moist tongue, frequent vomiting, considerable diarrhea, marked emaciation, and abundant expectoration. He lived on koumiss exclusively for two weeks, during the latter of which he took also small doses of eriodyction as an alterative expectorant. After the first day there was no more vomiting or diarrhea. During the third week small quantities of solid food were given, in addition to the koumiss. In the fourth week skimmed milk was substituted, and now, at the close of five weeks, he takes one and a half quarts of milk daily, besides a fair amount of solid food, all of which is thoroughly digested. He has gained five pounds in weight, and considerably in strength; cough and expectoration have diminished, and there is slight improvement in the physical signs. Fluid extract of eriodyction has been given steadily, and for the past two weeks six grains of quinia have been taken daily.

As an exclusive diet, koumiss is adapted to all those cases where we employ milk in this way with such remarkable results, but, of course, it would have no especial advantage except in those peculiar instances where milk cannot be digested. Thus I have met with several cases of cardiac disease, with marked secondary hepatic and gastric congestion, where skimmed milk could not be digested, and where it was almost impossible to find any article of food that the patient could take, in which koumiss was used with entire success. In one such case, seen in consultation with Dr. Hollingsworth Neill, the patient, who had been suffering greatly from gastric distress, aggravated by all kinds of food, received immediate relief from the use of koumiss, which was taken with great relish for a long time.

As an illustration of its value in another kind of cases, I may refer to a patient with extreme nervous exhaustion and intense anæmia, who suffered violently from pyrosis and gastralgia. While out of bed it was impossible to secure improvement. Even when complete and prolonged rest in bed was secured, with the aid of massage, general electrization and faradization, it was equally impossible to feed her sufficiently, so as to lessen the anæmia and relieve the distressing nervous symptoms. Milk was tried repeatedly, and always disagreed; its use, even in small quantities at stated intervals, caused intense distress. Iron could not be tolerated in any form; suppositories containing iron caused rectal irritation; hypodermic injections of dialyzed iron (Wyeth's) caused abscesses. The internal use of the latter preparation of iron, as well as of many others, even in the smallest dose, produced suffering. In this trying condition koumiss proved perfectly acceptable, and for a number of weeks the patient used it, first as the sole article of food, and later in addition to a very simple diet, with excellent results. Flesh was gained, strength increased, and the general nervous symptoms and the gastric distress rapidly improved.

It will immediately occur to many that koumiss must prove a very valuable remedy in diabetes mellitus, and so it does. I have had the opportunity of using it only in one such case, but here the immediate reduction in the amount of urine, almost to the normal, and the remarkable diminution in the proportion of sugar, showed conclusively its great importance as an exclusive article of diet in this affection. A diet of skimmed milk is often found of great service in relieving the symptoms in diabetes, but koumiss will probably be found much more desirable, since the sugar of milk is, for the most part, decomposed, while the carbonic acid gas acts as a grateful sedative to the irritable stomach. I think, moreover, that koumiss allays thirst better than milk does.

In the following case of simple polyuria, koumiss produced very marked and rapid results: E. S., a sailor, aged 43 years, was admitted to the University Hospital, Dec. 20, 1877. He had had diarrhea for three months, had lost a great deal of flesh, and was pale and weak. He complained greatly of thirst, and passed ten pints of urine daily, of low specific gravity, and containing neither albumen nor sugar. A diet of skimmed milk, with injections into the large intestine of weak solutions of nitrate of silver, quickly arrested the diarrhea, but produced no effect on the polyuria. He was then allowed a mixed diet, and dialyzed iron and ergot were given him for more than two weeks, in very large doses, but only a very slight decrease in the amount of urine followed, from ten to eight and a half pints, and he continued to lose color, strength, and flesh. On January 30th all medication was stopped, and he was ordered to bed. The next day he was put on an exclusive diet of koumiss, one quart being given in the course of twenty-four hours. This was continued for one week, with the following effects: He lost three and a half pounds in weight, and passed urine on the successive days as follows: January 30th, eight and a half pints; January 31st, eight and a quarter pints; February 1st, four pints, two ounces; February 2d, two pints; February 3d, one pint, ten ounces; February 4th, one pint, seven ounces; February 5th, one pint, eleven ounces.

On February 6th solid food was conjoined with the koumiss, and finding that no increase in the amount of urine occurred, the latter was discontinued, and he was allowed to eat as much as he wanted of simple, nourishing food. His appetite was very good, and he ate freely, without the least inconvenience. His weight increased, according to the careful observations of my resident physician, Dr. Skillern, and of the head nurse, no less than twenty-one pounds in seven days. The extraordinary change in his appearance confirmed this statement, and I have no doubt of its entire accuracy. He soon felt perfectly well; there was not the least return of polyuria, and he was discharged to return to his calling.

I have thus briefly alluded to some of the conditions in which I have found koumiss of positive value. The results I have already obtained convince me that in suitable cases it will prove an important addition to our means of treatment.—*Med. and Surg. Reporter.*

OPIUM VS. COFFEE.

M. RICHET says, in a popular article, in the *Revue des Deux Mondes:*

Opium has its antidote; just as we can produce sleep, so, too, can we produce sleeplessness, by the employment of a mind poison whose effects are diametrically opposite to those of the other. The antidote of opium is coffee. One hundred years ago coffee was almost unknown, but now there is hardly another beverage that is so widely distributed. Every one has it in his power to judge of the effects of coffee. For some persons it is a stimulus necessary for the performance of intellectual work. In others it produces a painful state of insomnia; taken even in weak doses it causes restlessness and anxiety, a sort of feverish activity altogether different from the indolent activity of opium. Under the action of opium the will seems to be lulled to sleep and the imagination runs riot. But under the influence of coffee the imagination is hardly stimulated at all, while there does appear to be excitation of the will. Did I not fear being suspected of having a theory to defend, I should say that the faculties of will and consciousness seem to be superexcited; there is, as it were, a constant strain on attention and memory, whereas, in the case of alcohol, hasheesh, and opium, there is a relaxing of attention. Hence coffee produces a true intoxication that fatigues one far more than does the somnolent intoxication of opium, but it leads to the same result. In striving to do too much, the mind does less; under stimulation the will is impaired; and the perfect equilibrium of the mental faculties is disturbed as well by excess as by defect of will.

SOME RECENT ADDITIONS TO THE BOTANICAL MATERIA MEDICA.

IT is not easy to keep pace with the rapid increments to medical botany. Almost every week brings out a new aspirant for popularity in this department.

One of the more important is the *Œnothera biennis*, the evening primrose. It is not exactly a new remedy, inasmuch as Dr. G. B. Wood states in the "United States Dispensatory" that the late Dr. R. E. Griffiths found it valuable in many diseases which show themselves by eruption. He used a decoction of the small branches, leaves, and the bark of the stem and larger branches, and applied this as a lotion to the affected part several times a day. He found it more useful in tetter than in any other disease. He considers its virtues to reside in the mucilage of the cortical layers, which leaves a slight sensation of acrimony on the fauces.

Early in 1877 Dr. R. N. S. Davies wrote to the *American Practitioner* stating that he had found it "a mild but efficient sedative to nervous sensibility, acting more especially on the pneumogastric nerve." He recommended it for further trial in whooping cough, spasmodic asthma, and certain sensitive conditions of the stomach interfering with healthy digestion. More lately Dr. J. F. Sullivan states that eight years' experience has taught him also to regard it as a mild sedative, with the additional property of being an alterative in many diseased conditions of the mucous surfaces. He has found it useful in many cases of dyspepsia, accompanied by an irritable state of the stomach and bladder, but believes its "chief value will be found in typhoid fever, to the treatment of which it is peculiarly adapted by its soothing action upon the intestinal mucous surface."

A more recent discovery is the *Sophora Speciosa*, a native of Texas, the bean of which is used. It has not yet been determined in what part the medicinal activity of the bean resides, but the probability is that it is in the testa. The seeds are contained in the pod, of yellowish-brown color, varying from 1 to 2¾ inches in length, and inclosing from one to five seeds. Professor Wood, Jr., has observed in them an apparently new alkaloid, for which he proposes the name of *Sophoria*. Half of one of the seeds is said to be sufficient to produce delicious exhilaration, followed by a sleep lasting one or two days. It is said that a whole seed will kill a man.

The *Duboisia Myoporoides* is an Australian species, of much therapeutic promise. It has marked mydriatic properties, resembling atropia. Its alkaloid, however, is a different substance. The solubility of duboisia in water is twice, or more than twice, that of atropine. It has more power in neutralizing acids than atropine. Its behavior to sulphuric acid (cold), and also when heated with bichromate of potash, differs from that of atropine. When boiled with baryta, the odor it evolves is entirely different from that given off by atropine under the same conditions

Dr. Brisbane, who introduced the plant to notice, stated that its physiological action would be found to be different from that of atropine; it is certainly much stronger, for the watery extract alone is equal, weight for weight, to atro-

pine. One very peculiar physiological effect is this: If a dose be given to a dog, subcutaneously, he will walk straight forward, and if he gets into a corner he will struggle and cry for a long time, and paw at the walls, but it appears never to occur to him to turn round. The same thing will happen if he gets mixed up with the legs of a chair; he will fight with them for some time before he gets out, and seems to have no notion of going anywhere but straight forward. On cats, however, it has not this effect.

Another potent substance is *ditain*. It is the bark of the *alstonia scholaris*, a native of Java, and has been found to contain an active principle, the physiological effects of which resemble those of curare. It is said to be an antipyretic, a vermifuge, and a poison. It has the property of paralyzing the intra-muscular terminations of the motor nerves and the spinal cord at the same time.

Without stopping to talk of *goa powder*, which has been several times referred to in the *Reporter*, as a source of chrysophanic acid, we pass on to *chaulmoogra oil*. This is a remedy which has been employed for centuries by the natives of India in the cure of leprosy and other forms of skin disease. It is a fixed oil procured by expression from the seeds of the *Gynocardia odorata*, which are now officinal in the Indian Pharmacopœia (*Gynocardiæ semina*). Mr. R. C. Lepage, late of Calcutta, has collected in pamphlet form all that is known regarding both the plant and the oil. The use of the latter was brought under the notice of the profession in 1854, by Dr. Mouat, of the Bengal Medical Service, who had employed it with considerable success in a few cases of leprosy, scrofula, and constitutional syphilis. But though others have found the remedy of service in these and allied affections, its more general employment has been retarded by the persistent adulteration of the oil by the natives of India. Dr. Dymock, of Bombay, however, has recently discovered means for detecting its adulteration, so that it is believed it can now be procured in a state of purity, and it is expected that the remedy will be found of real service in the above-mentioned diseases, and others of a similar nature. The dose of the oil, which is somewhat unpleasant in flavor and smell, is from five to six drops, gradually increased. It is best given after meals, and may be taken in milk, glycerine, or cod-liver oil. The seeds, coarsely powdered, may be given in the form of pills of five or six grains. In skin diseases the oil should also be applied externally, or the unguentum gynocardiæ (I. P.), which is prepared by beating the seeds to a paste along with simple ointment.

Finally the *Pinus Cembra*, or Siberian stone pine, is given as the source of a valuable drug in bronchial affections, popularly known in Northern Europe as "Riga balsam." It is prepared by distillation from the fresh shoots of the tree. —*Medical and Surgical Reporter.*

ON THE PHYSIOLOGICAL AND THERAPEUTICAL PROPERTIES OF GLYCERINE.

By M. A. CATILLON.

[Communication to la Société de Médecine Pratique.]

Observations on the Expired Air after the Administration of Glycerine.—In a preceding communication M. Catillon established the fact that glycerine, when introduced into the economy, causes a notable diminution in the quantity of the urea excreted during the twenty-four hours, with a coincident elevation of the animal temperature; at the same time the subjects to which it was administered increased in weight. Besides this he proved that it was entirely absorbed, that only a relatively small proportion escaped with the urine, the only means by which it was eliminated, and that notwithstanding this fact it could not be found in the blood. From these facts he concluded that it served as an aliment in respiratory combustion, which consequently spared the fat and nitrogenized compounds of the organism. Thus he explained the augmentation in weight of those subjects who took glycerine, and also the diminution of the quantity of urea excreted coincident with the elevation of temperature. The combustion of azotized material was replaced by another combustion, that of glycerine.

But glycerine gives as the ultimate products of its combustion carbonic acid and water ($C_6H_8O_6+14O=6CO_2+8HO$) and we should therefore find a much larger proportion of these elements in the expired air after its ingestion if, as he has said, it is burned in the blood in the same proportion in which it enters that fluid. Such was the question proposed to be determined in a series of experiments made in the laboratory of Prof. Vulpian, which gave the following results:

Glycerine administered to dogs, without food, caused an elevation of the proportion in 100 parts of carbonic acid contained in the expired air. This proportion, which was about 4·3 per cent. before the experiment, became increased to 6 per cent. under the influence of a dose of glycerine corresponding to 3 or 4 grammes for every kilogramme of the animal's weight, and to 7 per cent. under the influence of a dose of 6 to 8 grammes to the kilogramme. Not only was the increase in the carbonic acid shown in a proportion raised according as the dose of glycerine was augmented, but even in the latter case it was prolonged for a greater time. The increase commenced about an hour after the ingestion, reached its maximum 3 or 4 hours after, and lasted from 5 to 10 hours after the dose. After the ingestion of glycerine, the number of respirations remaining the same, their fullness increases, and the increase remains even when the proportion of carbonic acid has returned to the normal, probably on account of the exercise to which the organ has been put. This augmentation of the fullness of the inspirations did not increase with the dose taken, for it remained the same with doses increasing to 50, 100, and 150 grammes. At the same time that the proportion in every hundred parts was augmented the absolute quantity of carbonic acid gas exhaled increased in such proportion that, in this form, nearly the whole of the carbon contained in the ingested glycerine could be recovered. The absolute quantity of carbonic acid exhaled per minute, before the experiment, by one of the dogs was about 175 c.c. It was raised to 263 c.c. under the influence of a dose of 150 grammes of glycerine, and to 288 c.c. under the influence of a dose of 150 grammes. This increase of the carbonic acid after the ingestion of glycerine was equally well shown in dogs whose respiration was abnormal on account of affections of the respiratory organs. In one of these in whom pneumonia was recognized the proportion of carbonic acid in 100 parts before the experiment was only 3·2, that is to say, very much below the normal average. It was raised after the ingestion of glycerine to 6·1. In an emphysematous dog the proportion of carbonic acid in 100 parts of expired air was normal, 4·4 per 100, but the fullness of the respirations was small. After the ingestion of glycerine the proportion of carbonic acid was raised to 6 in 100, and the volume of expired air was found doubled, so that the absolute quantity of carbonic acid exhaled was considerably increased. The transformation of glycerine into water and carbonic acid takes place directly, for there was not found in the blood any of the intermediate products of oxidation—glycerine, formic or oxalic acids. Numerous differences between the properties of glycerine and alcohol have already been pointed out. Contrary to the case of alcohol, which MM. Duroy, Lallemant, and Perrin found was eliminated under its own form, and which they found in the blood, the brain, and the liver, glycerine is not found in any organ, and is eliminated almost entirely under the form of water and carbonic acid.—F. A. L., *in La France Médicale.*

LINES ON THE SURFACE OF THE NAILS.

MR. J. HUTCHINSON says, in the *Medical Times and Gazette:* It has been observed that during febrile ailments and various other more or less acute derangements of health, the nutrition of the nail suffers. A record of each relapse or exacerbation, permanent during the life of the nail, is left on its surface in the form of a transverse furrow. As the age of an oyster may be reckoned by counting the ridges on its convex shell, so in these cases may the number of relapses and the relative duration of the intervals be estimated. Dr. Wilks, in his original short article on this subject (*Lancet*, January 2d, 1869, page 5), infers, from the known rate of growth of the nail being equal to two full lengths a year, that furrows on the middle of the nail indicate an illness three months before. He mentions the case of a gentleman in whom the furrow formed on the nails as the result of a very severe diarrhea attended by much prostration. Another patient with heart disease showed the markings after the occurrence of an illness. A third showed some distinct lines on his nails a few weeks after an acute attack of chest disease, which ended in phthisis. The markings are caused, writes Dr. Wilks, "by a slight furrow, which is found more especially on the middle of the nail, and more distinct on that of the thumb. They point, no doubt, to a sudden arrest of the nutritive process during the time of the illness, and herein lies the interest of the observation." My colleague, Dr. Langdon Down, in 1870, communicated to the Pathological Society the case of a gentleman on whose finger and toe nails two distinct sets of transverse *white* lines appeared, after he had been twice much out of health from severe overwork; the symptoms were great prostration, intermittent action of the heart, and ulceration of one cornea. The nail marks corresponded in position to the respective dates of these two attacks, which occurred within a few weeks of each other.

HEMIPLEGIA FROM CEREBRAL HEMORRHAGE.

Clinic of Prof. AUSTIN FLINT, Sr., M. D., Bellevue Hospital, N. Y.

HERE is a patient, you observe, whose eyes are open, but, as Shakespeare would say, there is not much speculation in them. The woman is in a semi-comatose condition, and I may as well say at once that she is suffering from an attack of hemiplegia following apoplexy. If we examine the face for paralysis, we find that the left angle of the mouth is somewhat drawn, and that there is a little difference in the expression of the two sides of the countenance. If she were able to put her face into action, however, the paralysis would be much more marked than it at present appears. I would also call your attention to the fact that there is a sudden flushing of the face, amounting to intense congestion, whenever she coughs or makes the effort of swallowing.

The hemiplegia is on the right side of the body, and you notice that when I raise the arm on that side from the bed, it is perfectly powerless, and falls, when released, like a heavy and inert body. The left arm, on the contrary, is entirely unaffected. The right lower extremity is also paralyzed, but she is still able to move it a little. Thus, for instance, you observe that she moves the toes now, when the sole of the foot is pricked with a pin. It is a question here, however, as to how far such movements may be voluntary in their character, and how far reflex. As a rule, you will remember, sensibility is not affected in such a hemiplegia as this, or if it is, that this is the case for only a comparatively short time. The paralysis remains motor and not sensory.

Let us now run rapidly over the history of this case, and in it I would incidentally direct your attention especially to two points. The first is as to the light which the history may throw upon the causation of the apoplexy, and the second is as to the effect of apoplexy and hemiplegia upon temperature.

The patient was admitted to the hospital four days ago. She is said to be seventy years of age, but no personal or family history could be obtained from her. As far as we are able to make out from the account given of her at the time of her admission, she was quite well up to five days ago. Then, while sitting in a chair, toward evening, she suddenly fell to the floor and was found to be paralyzed, as at present. She was also apparently aphasic, though there is room for some doubt on this point, as the speechlessness may have been due to the partial unconsciousness resulting from the attack. One unusual and interesting feature of the case was that she was totally unable to swallow.

When brought to the hospital the following day she was found to be in a semi-comatose condition, with the upper and lower extremities on the right side partially paralyzed. As is generally the rule in such cases, the paralysis was more complete in the arm than in the lower extremity, while there was considerable rigidity about the muscles of both members. The mouth was somewhat drawn to the left, and the right cheek was more flaccid than the left. The intellect was found to be markedly impaired, but it was observed that the patient frequently put the hand of the unparalyzed arm up to the left side of the head, as if she suffered some pain there. The head was turned toward the opposite side of the body from that on which the paralysis occurred. This is ordinarily the case for the first few days after an attack of this kind, and then the symptom disappears. At present you notice that the patient still holds her head in this position, though it is not turned to the side to such an extent as at first. The pulse was slow, the respiration normal, and the temperature 100°. The heart, liver and spleen were normal, and nutrition was good, but she had some general bronchitis. It was observed that the patient groaned quite frequently, and this is found still to be the case.

In the way of treatment she was given at first two drops of croton oil, and that night she had two free evacuations of the bowels. Being entirely unable to swallow, a pint of milk, with two ounces of whisky, was given her, by means of the stomach-pump, soon after admission. A nutritive enema was also tried, but was not retained. Subsequently, however, a tannic acid suppository was inserted into the rectum, and after that there was no further trouble about the retention of such enemata. The inability to swallow has continued up to the present time, and so it is still necessary to keep up the nourishment of the patient in the same manner.

During the first day and evening after admission, the temperature in the right axilla, taken at different times, was respectively 101°, 100° and 100°; while that in the left axilla, taken at the same periods, was respectively 97°, 95° and 97°. On the second day the observations were 100¼°, 100° and 100° in the right axilla, and 99°, 98¾° and 98° in the left. On the third day, 100°, 100° and 100° in the right axilla, and 96°, 98° and 98¼° in the left. On the fourth day (yesterday) there was a marked change in the relative degrees of temperature of the two sides of the body. In the morning the temperature in the right axilla was 100°, while that in the left was 98½°. In the afternoon, however, the temperature in the right axilla was 99°, and that in the left 100°, while later in the evening it had fallen to 97° in the right axilla and risen to 100½° in the left. This, you perceive, is just the reverse of what took place at first.

To-day, again, still another change has taken place in the relative temperature of the two sides. Early this morning much the same state of affairs was observed as last evening, but since then the degrees of temperature have become more and more nearly approximated, until now they are almost identical. The following is the record of the observations to-day: In the right axilla, 99°, 98¾° and 98°. In the left axilla, 100½°, 100° and 98°. The phenomena observed here in regard to the temperature are certainly of exceeding interest, though they may, perhaps not be of great importance in a practical point of view. As a general rule in such cases it is found, as in the present instance, that at first the temperature is comparatively high on the affected side, while upon the unparalyzed side it falls considerably below the normal standard. After a few days the relative temperature of the two sides is completely reversed, and then, as we have seen here, it becomes uniform in both.

We are now to examine what the probable cause of this attack has been. The phenomena observed, in general terms, are those of apoplexy and hemiplegia, and it is therefore necessary for us to place before our minds the different conditions which are capable of producing such results. In the first place, I may observe that the circumstance of the apoplexy coming before the hemiplegia enables us, in this case, to entirely exclude meningeal hemorrhage, which would indeed give rise to apoplexy, but would not be followed by paralysis.

A tumor of the brain, on the other hand, might explain the paralysis, but could scarcely occasion such an apoplectic seizure as occurred here, though these intracranial growths not infrequently give rise to epileptiform convulsions.

In reality, however, the diagnosis lies chiefly between two conditions, viz., cerebral embolism and cerebral hemorrhage, Let us therefore ask ourselves what points in the case form one and what the other affection. In both it is well to remember we might have loss of consciousness, either complete or partial, and in both we would expect to find hemiplegia.

Now as to the points of difference. In the first place, embolism can ordinarily only occur as a result of cardiac disease, and as we have seen that the heart is in a healthy condition here, this is certainly a very strong point against embolism. Secondly, the age of the patient is against the supposition of embolism, which almost always occurs in early or middle life. Cerebral hemorrhage, on the other hand, occurs, as a rule, in advanced life.

Next let us inquire if the side which is paralyzed has any bearing on the causation of the hemiplegia? Yes, this point would seem to favor embolism, for in the larger proportion of cases hemiplegia due to this condition is on the right side, as in the present instance. Still this does not, of course, exclude cerebral hemorrhage, which is liable to produce paralysis of either side of the body.

Another point to be taken into consideration is whether the patient has improved or not since the onset of the attack. It is now five days since she was stricken down with the paralysis. The ordinary rule is that in hemiplegia from embolism more distinct improvement, both as regards the intellectual faculties and the paralysis, takes place within such a period than is the case here. Indeed, it can hardly be said that there is as yet any appreciable change at all in the patient's condition.

These are the more important points to be taken into consideration in making up our minds as to the diagnosis, and, in view of the evidence which they afford, I think we are justified in excluding embolism and regarding cerebral hemorrhage as the cause of the trouble here. Perhaps it may be as well, however, to mention two additional points which go to corroborate this opinion. The first is that the patient, from time to time, puts her hand to the left side of the head, as though she felt pain there. If there is a clot present, it has no doubt acted as a foreign body, and excited a certain amount of cerebritis in the tissue surrounding it. The carrying of the hand to the head, which indicates that the patient feels pain or at least a sense of discomfort there, is a symptom to which I am accustomed to attach considerable importance in such cases.

And this brings me to the second point alluded to. Not only has this inflammatory action given rise to pain, but also to some increase in temperature. Yesterday and to-day, as we have seen, the temperature has been abnormally high upon the left side of the body, which is the unaffected one. The increase in temperature, for the first few days, on the right side, was unquestionably due to the direct influence of the paralysis on that side, and ought not, therefore, to be considered as indicative of fever in the system.

It is then pretty certain that we have a clot to deal with here, and if you ask me where it is located, I can answer, with a considerable amount of assurance, in the *corpus striatum* of the left hemisphere of the brain. The *corpora striata* are the usual seats of such cerebral hemorrhage, and there is nothing to indicate that it is located elsewhere in the present case.

The indications for treatment are exceedingly simple here. The patient's bowels have been moved, and we have only to keep her perfectly at rest and supply her with appropriate nourishment. As has already been mentioned, there is one peculiarity about this case, and that is that the woman is unable to swallow. Consequently, it will of course be necessary to continue feeding her, for the present at least, in the same manner hitherto resorted to. I may also mention that she does not pass her water of her own accord, so that the bladder has to be emptied from time to time by means of the catheter. It is possible that the patient may never emerge from the semi-comatose condition in which she has remained ever since her admission to the hospital, but the probabilities are that a gradual improvement will take place in her condition.—*Med. and Surg. Reporter.*

PILL COATING.*

By EDWARD S. BULL.

THE subject of this paper, although not at present in constant use, is very important to the pharmacist, and the number of prescriptions (daily increasing) which have to be dispensed, in which pills are ordered *to be coated*, claims for it a little attention. We have heard a good deal of late about pill coating. Some of the processes I shall bring before you to-night are taken from papers which have already been published, and formulæ extracted from journals, etc. However, a few of the processes may be new to my hearers.

We are all well acquainted with the old and still general method of dispensing pills, namely, rolling them in fine powders, such as magnesia, licorice, starch, lycopodium, etc., any of which powders, adhering to the moisture of the pill, form a kind of coating, but do not cover the taste and odor of the substances of which the pills are composed.

As pharmacy progressed, the attention of the pharmacist was absorbed in devising some means for making pills pleasing to the eye and agreeable to the palate.

One of the earliest methods used to attain this end was covering them with a solution of gelatine, which effectually conceals the taste and odor, and prevents chemical change in the pill from exposure to air.

We have now besides this several methods of pill coating, namely, varnishing, chalk coating (Creta. Gall.), sugar-coating, covering with gold or silver leaf, on each of which processes I shall make a few remarks.

Before attempting to coat pills it is needless for me to impress upon dispensers the necessity of having the pills perfectly round and hard—when I say *hard* I don't mean that they are to be made like marbles—a firm consistence is all that is required; for when properly coated they should retain that consistence for a considerable time, and not harden like pills merely kept in powders.

When practicable I should recommend that, in place of the essential oils put in the pills to prevent griping, such principles as gingerine, capsicine, etc., should be used, as the oils very often soak through the coating and discolor it. I find also when glycerine has been used as an excipient that the pills do not so readily take the coating, neither is the latter so permanent as it is under other circumstances. This is probably due to the hygroscopic nature of the glycerine.

When the pills contain essential oil they should, previous to being coated, be covered with a varnish consisting of gum juniper dissolved in ether or other varnish. A little common resin in the varnish greatly assists the adhesion of the coating.

The method adopted by M. Garot to cover pills with gelatine was to make a solution of gelatine in a small quantity of water, which is to be kept liquid by means of a water-bath. Each pill, suspended on the point of a pin, is dipped and afterward allowed to dry; the pin is then withdrawn, previously being warmed, which causes the orifice to close up. When coating pills with gelatine the solution should be kept at a certain density by the addition of water to allow for evaporation. Collodion has been used as a coating, but does not meet with approval on account of its doubtful solubility.

The varnishes in ordinary use are solutions of mastic, gum juniper, resin, or balsam of Tolu, dissolved in ether or chloroform in the proportion of 1 to 4. To varnish the pills, they must be put into a pot (an ordinary ointment pot answers very well); the varnish is then poured on, the pot quickly shaken, and the pills thrown upon a tray or slab; in a few minutes the ether or chloroform has evaporated, and the pills present a shiny varnished appearance. I find that if the slab is previously very slightly smeared with almond oil a much better result is obtained, as otherwise the pills are apt to stick in one place.

The pills, varnished with gum juniper, I notice, become very dull, and present a powdery appearance by constant friction with each other; the mastic solution does not produce a bright varnish; therefore I make it a rule to use the solution of either balsam or resin of Tolu.

I have tried to form a pearl coating on pills by first varnishing them with Tolu, and, before the varnish is dry, throwing them into a tin containing finely-powdered French chalk, or a mixture of French chalk and magnesia, and then shaking them with a rotary motion, but the result has in each case been most unsatisfactory, the powder adhering to the varnish very unevenly. The varnish I have found best for this kind of coating is one consisting of Canada balsam and ether. I exhibit here some pills first moistened with this varnish, and then rolled in a mixture of French chalk and magnesia over a spirit lamp; these pills at first were of a good color and presented a glossy appearance, but after keeping for six months they have become dull and of a dirty yellow color.

A few years ago a gentleman advertised for sale a recipe for coating pills. This proved to be simply to moisten the pills with mucilage of acacia (about one of gum to seven of water), and afterward rotate them in finely-powdered French chalk. I have never got a very good coating by this method, but a tolerably good appearance can be given to the pills by repeating the process several times, allowing each coat to dry before applying another.

I could prolong this paper considerably by enumerating the different methods I have tried in order to coat pills, but as the reverses I have met with would not prove very interesting, I will simply give you a few processes from which I have gained good results. What we most need is some method for coating pills in small quantities. The specimens I have on the table will give you some idea of how the pills will look after adopting the following methods, but I would recommend you not to be discouraged if at first you do not succeed as well as you could desire, as the result depends not so much on the component parts of the coating as on the manipulation.

A mucilage should be used, consisting of 1 part mucilag. acaciæ (B.P.) and 3 parts distilled water. A very good coating can be produced by first moistening the pills with this mixture and afterward rotating them in a basin or covered pot containing French chalk or a mixture of French chalk, 1 part, and heavy calcined magnesia, 2 parts. After well shaking the pills in this powder transfer them to another pot containing French chalk only, again shake them well, and finish by rotating in a clean dry basin without any powder. You can in this way coat any number of pills in a very short time.

Another process worth trying is to moisten the pills with mucilage and shake them in plaster of Paris, which forms a groundwork upon which, when dried and again moistened with mucilage, French chalk will adhere and form a very pearl-like coating.

I have tried diluted albumen, but have not met with good success.* By first moistening the pills with an emulsion, consisting of balsam of Tolu 3 j, mucilag. acac. 3 ij, and water 3 ss, and afterward rotating them, as above, in French chalk, with or without magnesia, a nice shining coating can be obtained, but it is objectionable on account of its yellow tint.

Another good method is to moisten the pill with a weak decoction of linseed, and afterward roll in a powder consisting of French chalk and powdered gum acacia.

A very good coating can be produced by rotating the pills, previously moistened with mucilage of tragacanth, in a mixture of French chalk, sugar, and magnesia, or French chalk, gum acacia, and magnesia, afterward polishing in French chalk alone. The appearance of the coating in most of the above cases can be varied by coloring the powder with a few grains of carmine or tumeric, scented with otto of roses or essence of lemon.

With regard to sugar-coating I cannot say much, as I have not met with very great success. The various processes no doubt answer best when carried out on a large scale. I have tried a method suggested by Mr. Symes, Ph.D., in a paper read before the Liverpool Chemists' Association. His process is as follows: The pills, well dried on the surface, are introduced into a tinned copper bowl with a flat bottom, or enameled iron dish, the surface of which has to be moistened with syrup or a mixture of syrup and gum; they are then rotated and gently heated, finely-powdered sugar being dusted on, and the motion kept up until a perfectly hard coating is obtained. This operation is repeated until the desired effect is produced. I find this answers very well, but prefer using a mixture of sugar and sugar of milk instead of sugar only. Before leaving this class of coating I must again impress upon you the necessity of proper manipulation. The first attempt generally proves a failure, but by perseverance a very good coating can be given to the pill by some of the above processes.

I need not describe to you the well-known way to silver pills, but I find a more polished appearance is obtained by allowing the pills to stand for a few minutes after covering with the leaf, and then rotating them in a dry pot. A little cotton-wool in the pot greatly assists in detaching any loose particles of leaf. Pills which contain chemicals likely to act on the silver, and those containing assafœtida, which, on account of the sulphur it contains, destroys the silver, should, previous to receiving the leaf, be varnished with Tolu.

* A paper recently read before the London Chemists' Assistants' Association.

* A friend informs me that he gets a good result by mixing albumen with diluted mucilage and rolling the pills in French chalk with the aid of heat. He keeps the albumen dried and powdered for use when required.

FLOORS.

WHEN a man with limited means determines to build for his own use, he is likely to be puzzled about floors. On the other hand, if he already owns or hires a house and is dissatisfied with the old method of carpeting, he is likely to be still more puzzled. When means are unlimited, the principal difficulty is removed, and various materials are available. For vestibules and halls there are a variety of tiles of marble or encaustic; the latter glazed, figured, parti-colored, and enameled, in endless combinations and patterns. For rooms there are inlays, or marquetry, in various colored hard woods, whose surface may be kept polished to a high degree of perfection. The "wood carpeting," a veneer of marquetry about a quarter of an inch thick and backed with canvas glued on, can be laid over an ordinary floor old or new, and wears well. These are all good but costly. Even the "wood carpeting," the cheapest of all, costs more than the best English Brussels carpeting, and requires a smooth "upper floor" for a proper foundation, while it involves the same outlay for rugs and mats as the others, and demands the same expensive care.

These are all as foreign to a small, inexpensive house as any other species of extravagance would be. The common need is for an even surface of pleasant but not decided color, and one that will not catch or show dirt unnecessarily, free from cracks, and tough enough to stand without marked injury the ordinary wear of "living rooms." Rugs must be used, if at all, for other reasons than the protection of the floor; for it cannot be expected that a surface subjected to common use, with only common care, can be maintained with a finish like that of furniture. Projecting nails in boots will leave marks, and dust and mud tracks will show at times, to the annoyance of the tidy housekeeper who has been used to having a large share of dirt absorbed and held by carpets from one spring cleaning to the next. It is an honest floor, however, and when you put your foot on it you may feel that you have got hold of a part of the house; and if the footprints show, the showing can be removed. All the dust will collect in little rolls of lint under furniture and in corners where it can be easily detected. Such a surface needs a little more care than the old-fashioned carpet, but the work is of a lighter character.

A "plain board floor" is the thing desired, and the name would seem to indicate something easy of attainment; but it is not so simple a matter as one would suppose. To select the material needs the best of judgment, and the work of laying calls for highly skilled labor.

The best stock for the purpose now in the market is Ohio white oak, clear, free from all defects and thoroughly seasoned and kiln-dried. The boards should be not over two and a half inches wide, "matched," that is, tongued and grooved, and "blind nailed," that is, nailed diagonally through the edge. The surface should be well smoothed with the plane after laying (of course being mill-planed before laying), the tool being used with the grain only, as any cross planing at the ends of boards or elsewhere makes bad spots after finish. In places where the plane cannot be worked a steel scraper should be used. The filling of the wood should be of the finest whiting or plaster of Paris (with a little coloring matter slightly darker than the tone of the wood) in kerosene oil or spirits of turpentine. It should be spread on evenly with a brush, and very thoroughly rubbed in with fine hard-wood shavings or cotton waste. The kerosene oil and spirits are merely "vehicles" to hold the filling in solution and assist in getting it into the pores of the wood. None of the filling should be left on the surface. As soon as dry it should have one thin coat of shellac. When this is dry (which will be in a few hours) the floor will be ready for use.

For its care when in use, certain things should be borne in mind: The common scouring or scrubbing with hot soapsuds is neither required nor allowable. It is true that the oak floors of the old-fashioned kitchens, which lasted and looked well for a hundred years or more, were scoured with soap and sand; but the labor was very great, and could hardly be had from the modern servant at any reasonable expense. A little more care in the filling and finish suits the present condition of things better. Any soiling from mud can be removed with a damp woolen cloth, any dust with a dry one. Sweeping with a brush, followed by wiping over with a dry woolen cloth tied over the brush, answers ordinary needs. About once in six months it is well to give the work a very thin coat of shellac. *No oil* should be used on it before or after finishing. The great mistake made in the treatment of hard woods, and especially where used in floors, is the amount of oil, wax, varnish, filling, and other gummy materials that are applied to and left on the surface. The beauty of all such finish is to have the wood show its natural color and grain. The thin coat of shellac, specified above, is meant simply to prevent any greasy dirt from striking into the wood and causing a stain that would require hard scrubbing or scraping to remove. If a floor is once polished it must always be kept so, and this requires hard work by an expert at frequent intervals. In countries where such is the custom, two men visit the house about once a week, and work with stiff waxed brushes fastened to their feet and others on long handles in their hands. With these they skate and rub over the floor for an hour or so until the surface has a glaze like a mirror. Here such labor would be expensive and otherwise inconvenient.

If properly laid and kept, oak boards should endure for a century and improve in appearance with increasing age. But thus prepared they are expensive, costing complete at this time about fifty dollars for an ordinary room. Nor is the cost of carpeting saved altogether, for the rags and mats needed near tables, doors, and fireplaces will amount to perhaps two-thirds the price of carpets, without going into any extravagance in the shape of Indian or Turkish fabrics; so that the house-builder with but a narrow margin for luxuries, although he might be led to adopt this method and material for the principal first-story rooms and hall, with perhaps the staircase landings and entries, where the hardest wear comes, would hesitate about the expense for the chambers. Hard woods of lesser cost for these would be white Western ash, white maple, black birch, cherry, and hard or Southern pine. Black walnut is too dark in color, except for partial use with other woods, and butternut is too soft. There are some other varieties that may, under some conditions of locality or special quality, be useful for the purpose; among these are brown ash and chestnut. But at present we confine consideration to the five more common and best tested varieties which we first named. If these are selected and laid with all the care prescribed for the oak, they will answer very well. The ash is lighter in color and coarser in grain than the oak, and improves less with age. Maple is light and rather cold in color, but has a fine even grain. Cherry has a very fine grain and nice warm tone of color, but shows marks a little more than coarser woods. Hard pine has a tendency to turn black if wet. The cost of these is from a third to a half less than oak.

Over an old floor any of the above woods can be laid, either one-half inch thick if matched and blind nailed, or one-quarter inch thick if square edged, in strips about two inches wide, nailed through the top with fine wire nails or long brads or finish nails. If quarter inch stuff is used, the floor on which it is nailed must have a very even surface, or the new work will be liable to be broken.

The least expensive floors that can be laid are of pine or spruce, and such are commonly used under carpets. Where they are to be left uncovered, nothing but extreme care in selection and finish will insure good work. Even at the best they will grow quite shabby under hard wear. The material is so soft and its color is so light that stain and shellac, or paint, are required to give a proper surface for use. No stain of a good tone of color has yet been devised that will penetrate the wood to such a depth that ordinary wear will not soon destroy it in places. Paint looks well at first but requires renewal, and its smell when new is neither pleasant nor wholesome in the house. When paint is used it should be put on in very thin coats and allowed to dry hard before use. The painting may be in party-colors, in a panel with margin or border and line, or it may be of a plain color and be spattered with another—or two if desired—a treatment which both looks and wears well for a time.

The greatest difficulty about all flooring—and this applies to some extent to the hard woods also—is to get proper stock. It seems at times as if good seasoned lumber were a thing of the past. Surveyors and dealers exercise the utmost ingenuity in devising ways to lower the standard of trade. Some years ago, if good, sound, clear, dry, straight-grained wood were needed, it was only necessary to describe it as "first quality" or "best." Now "first quality" means nothing, or perhaps an inferior third quality. To get the real first, if it can be had at all, a string of newly invented special terms must be used combined with two or three X's or other symbols, and even these terms and signs keep changing with the gradual degeneracy of lumber manufacture.

Flooring boards, to be fit for exposed wear, should be sawed from the heart of the log, and be of absolutely straight grain, entirely free from knots, and of clear, even color. Every board should be examined separately before laid, and none but careful and experienced workmen be employed to lay them. They should be well seasoned and "kiln dried" enough to stand furnace heat. There is such a thing as too much "kiln drying," which "takes the life out" of wood, causing it to absorb moisture from the air and swell. Boards to stand wear should never be sawed "slash-wise," that is, parallel or nearly so with the flat grain of the wood, as in the outside slabs of a log. They should be "quarter sawed," that is, the log should be sawed in quarters and the boards from the flat sides of the quarters. This increases the difficulty of sawing, but gives more good boards. Stock that shows wavy lines and marks, such as would be chosen for panels and furniture, is not desirable for floors. Any little edges, that under hard wear will scale up or become rough, are bad. Unless there is to be a pattern of colored woods, as in marquetry, it is no object to have any variety. A plain, even surface of dull, rich tint with a finish smooth but not slippery is what is needed.

It is hardly necessary to advocate or defend bare floors against carpeted ones. They are rapidly coming into use, not so much from fashion as because experience has convinced housekeepers that the objections to them are unfounded or are overbalanced by their merits. They are found not to be cold or noisy to any degree. Their so-called bare and cheerless aspect vanishes as the eye becomes accustomed to them; but, best of all, the labor of housekeeping is very materially reduced by their use. If rugs are selected of such materials as do not wear off in the form of lint too rapidly—rugs made of Brussels carpeting are very good in this respect, while those of Kidderminster are the reverse—the amount of dirt and dust that will collect in the ordinary use of a room is surprisingly small.

On the ground of expense, although the cost of a good

hard-wood floor with the necessary rugs may equal or even somewhat exceed that of the old style with carpets, ten years of use will show a money balance in favor of the former, while their advantages as labor-saving contrivances will be admitted in as many weeks.—J. A. F., *in Boston Journal of Chemistry.*

A REED, AND HOW IT IS MADE.

EVERY loom has a reed, or its equivalent, and no greater proof could be given as to how far it is indispensable in the weaving of fabrics. The thing itself is very simple, consisting merely of a series of parallel flat wires held at the proper distances apart at their extremities by means of wooden rods, approximately half round in section, the whole being bound together with tarred cotton cord. A section of a reed is shown in Fig. 1. Simple as it is, when properly made it is a piece of work that may worthily win the admiration even of those who are unacquainted with the details of its manufacture, and who therefore cannot appreciate the skill in workshop manipulation involved in its production, or the inventive talent that has been displayed before the article

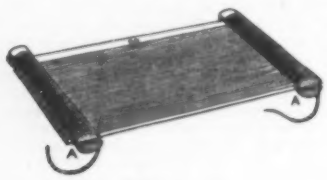


FIG. 1.

could be placed in the market at its present price. Reed-making as a trade is not one of vast importance, although we scarcely concur with a reed manufacturer when he described the business as a "tinpot" one. From his point of view there would be very many, nay, an innumerable number of "tinpot" concerns in this country, and yet without them where would we be? Time was, it is true, when the reed-maker would gain but little by a comparison with the wandering knife-grinder and tinker of our country districts, but the vast development of our textile industries has now raised the art to a position of greater dignity, and at present it is not uncommon to find establishments with resources of some extent devoted to reed-making. It is a little curious, however, that in nearly every case the business of knitting healds goes hand in hand with the former. This is the case in Mr. Henry Tetlow's factory (quite a model in its way), in Varley street, Oldham road, Manchester. Before entering on the manufacture of a reed according to the latest methods, which require a plant consisting of several machines, a few words descriptive of the process when performed by hand may not be out of place, more particularly when hand-made reeds are by some manufacturers preferred to those turned out by a machine—which eccentric preference, by the way, is a trifle difficult to account for.

Referring to Fig. 1, the four pieces of wood, A, each about ten to twelve feet long, are clamped at one end, so as to be the proper distance apart, and at a few inches above the top surface of the bench. The reed-maker sits in front of the bench, and commences at the left hand end, which is the one nearest the clamp. He begins by winding on each pair a few turns of his tarred cotton cord, the thickness of which varies with the counts of the reeds he intends to construct. Usually the cotton is the desired number of folds of 32's twist, four ply. A few gas jets burn at a short distance from the reed, the heat from which keeps the cords soft. Before putting in the dents the operative inserts, close up to the preliminary turns of cord, a stout flattened piece of wire, of a thickness equal to the widths of the wire dents. He now laps the cord once round on each pair of rods, inserts the first dent, binds the whole together with another lap on each pair of rods, then inserts the third dent, and so on. Every time he places a dent, he knocks it up with a peculiar tool, which he slides with his right hand along the rods. The dents are somewhat longer than the pairs of rods are apart, and, as a guide in inserting them, one of the uppermost rods is marked into divisions with a rule. This process is slow, ten dents a minute being the usual capability of an average workman, the pay he receives being about sixpence per 400 dents.

It is proper to remark that in the reed trade the flat wires themselves are called "dents," whereas with the weaver "dents" mean the spaces between, "so many ends in a dent" being a common expression. Whichever nomenclature be the correct one (and "dent" being the French for "tooth" we incline to the reed-makers') is practically a matter of indifference, for in a reed the wires or spaces go in equal counts to the inch or other linear dimension.

In the foregoing we have partly anticipated. The dents before they can be set into the form of a reed have themselves to be made. They are manufactured from the best Swedish iron wire, which reaches the reed-maker in its usual marketable condition, viz., round and coiled. It is selected of a gauge suitable for producing dents of the required thickness and width. The first process is to flatten it. The machine for this purpose is represented in Fig. 2. The round wire is coiled on one of the narrow drums shown at the back end, is then passed between the two solid rollers about 9 ins. in diameter placed in the upright double brackets, and is again coiled on the drums toward the front. These latter are driven from a pulley on the spindles of the top rollers by the crossed bands illustrated. On the bosses of the drums will be seen an arrangement of gear. This is a "sun and planet" motion, and as it works in connection with a peculiarly-shaped cam it gives an alternating side traverse motion to the drum, which causes the wire to coil in even layers in the circumference of the latter. The wire is flattened in its passage between the rollers to an extent determined by the distance the latter are apart, which distance is adjustable by the set screws seen at the top of each bracket. When the receiving-drum has obtained its full complement of wire, it with the contained wire is removed bodily to a machine where the wire is straightened, or, in technical language, "plated." To attain this end the wire is conveyed on its flat between two plates firmly held together, and is made to take a serpentine course around pegs suitably disposed, against which the edges of the wire work. The drum which formerly received the wire now pays it out to a similar one at the other end of the plating machine, the drums being taken from one machine to another when the wire is to be differently operated upon. After plating the edges are cut so as to give the proper width for the dents. This is accomplished by passing the wire, again on its flat, between two cutting tools situated at the required distance apart. In a similar machine the edges are afterward "gouged" or "beveled;" more correctly, perhaps, they are rounded. Next in order follows "filing," the object of which is to make the wire perfectly smooth. This is attained by transmitting it from one drum to another as before, the wire in its passage being brought under the treatment of a series of diminutive files disposed so as to act all round it. Lastly in this series of operations comes "pegging," which is straightening the wire on the flats by passing once more in the serpentine fashion; this time, however, the pegs are in contact with the flats and not with the edges. The wire may now be wound on tin drums in coils of about 80 lbs. weight, in which form it is exported or sold for reed-making. It enters the market in another form also, that is, cut into dents of lengths which vary from 3¼ to 7 ins., suitable for the various descriptions of reeds. A neat little machine at Mr. Tetlow's was capable of cutting (automatically, of course) as many as 20,000 dents per hour.

When the reeds have to be machine made, the dents are not cut in this manner, but the wire is at once coiled on a drum for the reed-making machine shown in Fig. 3. The machine here represented is one manufactured by Mr. Tetlow, as are the ones previously described, and it embodies several improvements he has introduced, and to which we shall allude further on. The headstock shown on the middle of the bed contains two hollow mandrils, whose distance apart is about equal to the width of the reed. Through each of these mandrils a pair of wooden rods, about twelve feet long, are passed, the ends of the rods being secured by clamps at *d, d.* The mandrils have a longitudinal, reciprocating motion, very rapid, but of short stroke, and their outer ends are provided with tools which closely surround each pair of rods. Brass bobbins, *b*, containing tarred twist, are rapidly carried in a circle, one around each of the pairs of rods, being placed over pegs on small radial arms driven by the small gear wheels seen on the headstock. The headstock advances slowly from left to right, and as the bobbin flies round the rods it lays the twist in the manner of a screw thread upon them, or, otherwise, in a helical fashion.

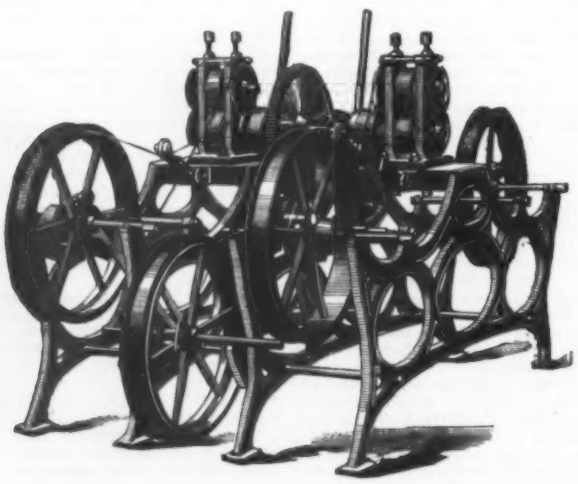


FIG. 2.—THE FLATTENING MACHINE.

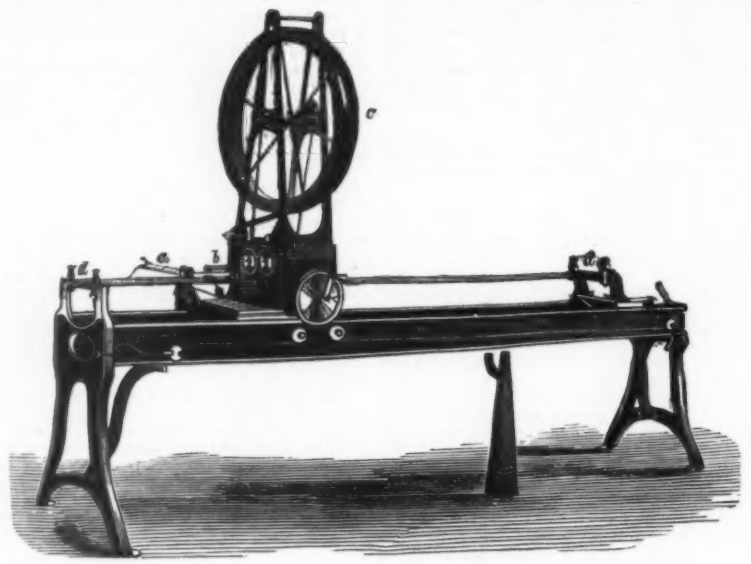


FIG. 3.—THE REED MACHINE.

The prepared wire is carried from the drum, *c*, and is made to enter between two small rollers, placed contiguous to the letter *a*. These rollers advance the end of the wire in a horizontal direction, through the space between the first pair of rods, then across the width of the reed, landing it finally between the second (or front) pair of rods also. A small cutter now snips it off close to the rollers; each bobbin deposits a coil of cotton cord, which coils are pressed home by means of the reciprocating tools above alluded to. When they have receded, the end of the wire once more advances, until the next dent is completely introduced, when it is cut off, the coils are lapped, pressed home, and so on. In this way three hundred to four hundred dents per minute have been inserted. The counts of the reed being made is governed by the rate at which the headstock travels along the bed. This may be varied, and therefore also the counts, by change wheels, provided with each machine. In some reed-making machines the headstock is stationary, and fixed in the middle of the bed, while the rods are made to advance at the proper speed to give the desired counts. This method, it will be seen, for the same work involves a machine of twice the length of one in which the headstock itself moves, and this is one of the advantages of the machine we illustrate.—*Textile Manufacturer.*

TIN PLATE.

THE new method of manufacturing tinned plates, invented by Dr. Francesco Belluomini, consists in the substitution of refractory clay cases in place of the cast-iron boxes hitherto employed for the annealing of the iron plates, and in the use of colophony in the tinning process in place of grease or palm oil. The iron plate during the various processes it undergoes before being tinned becomes raw and brittle and is unfit for folding; in order to remedy this defect it is annealed in closed boxes of cast-iron in particular ovens for the annealing of closed vessels. The ovens having been heated for several hours are allowed to cool, and the hermetically closed boxes are only opened and the plates removed when cold. The continual changes of temperature cause a great consumption of the cast-iron boxes; in fact, Jullien calculates on an average that there is an outlay of 1 fr. 60c., or 1s. 4d., in boxes for every 100 kilogrammes of annealed iron plate, which would be equivalent to 81c., or 8½d., for every case of tin plate marked I C. It is, therefore, of the highest advantage in the manufacture of tin plates that there should be found an economical method of annealing the iron plate in closed cases made of a material which costs little, which stands fire better than cast-iron, and which effects equally useful results. The above results he has succeeded in obtaining by the adoption of refractory clay cases, which possess all the needful requirements.

The advantage of price which would result from the substitution of refractory clay cases in the place of cast-iron boxes for annealing the iron plates may be calculated above 50c., or 5d., per case of tin plate. The iron plates in order to become tin plate receive a coating of tin. Previous to the tinning process the iron plates must be thoroughly cleansed from oxide, and to avoid the re-formation of oxide they are kept in water until they are to be tinned. As the plates would not take on the tin coating were they plunged wet with water into the tin, they have to be dipped into a substance which removes the water and covers them with a coating, so as to protect them from oxidation.

Hitherto the plates have been immersed in grease or oil previous to being plunged into the tin pot. By this method a kilogramme of grease or oil was consumed for every case of tin plate. He has found that colophony produces the same effect, and can, therefore, be perfectly safely substituted for

grease or oil. The great advantage of this discovery may be estimated by the fact that grease or oil costs from 100 fr. to 120 fr. per 100 kilogrammes, and that colophony costs on an average 24 fr. to 26 fr.; consequently there would be a saving of 60c., or 6d., for every case of tin plate. The cases for annealing the iron plate should be made of refractory clay, should be solid, and of the same form as those of cast-iron. They should exceed in size by 15 c., or 5⅞ ins., in length, and by 5 c., or 2 ins., in breadth, the iron-plates they contain. When the plates are deposited in the cases the covers should be laid on and be made tight with clay to prevent the air from penetrating. The cases are then introduced into the oven, and are heated in the usual manner. The colophony should be of ordinary quality, and having been melted in ordinary pots employed for the grease it should be kept in a state of fusion. The wet iron plates should be plunged vertically one by one into the resin pot, and be left there until the cessation of the ebullition produced by the water in the colophony. They should then be removed by means of tongs, and be immersed into the tin pot. The remainder of the process should be effected in the ordinary manner.

ON A NEW METHOD FOR THE SEPARATION AND SUBSEQUENT TREATMENT OF PRECIPITATES IN CHEMICAL ANALYSIS.*

By F. A. GOOCH.

THE introduction of Bunsen's method of filtration and immediate ignition of precipitates in the moist condition has left little to be desired as regards accuracy of result and rapidity of execution in the treatment of precipitates which may be submitted to high temperatures in contact with carbonaceous matter. In analytical methods which require that filter-paper and precipitate shall be ignited apart, or dried together at a temperature below the point at which paper begins to char, the same degree of exactness has not in general been hitherto attained.

To obviate the difficulty of bringing a paper filter of ordinary dimensions, particularly when covered with a voluminous precipitate, to a definite condition of desiccation, the sand-filters of Dr. Gibbs and Taylor,* the porous cones

FIG. 1.

FIG. 2.

of Munroe,† and, finally, the process of reverse filtering, first applied to qualitative work by Carmichael,‡, improved by Casamajor,§ and thoroughly elaborated by Prof. Cooke,‖ have been successively brought forward.

The latter process gives most excellent results in the separation of precipitates which settle quickly and completely; and, inasmuch as many precipitates which of themselves are not inclined to fall rapidly may be made to do so by proper treatment (by boiling, for example, the addition of ammonium salts, Chatard's ¶ method of granulating gelatinous precipitates, or other similar device), the field of usefulness of this process is wide.

The sand-filters in skillful hands, and the porous cones with no more than ordinary care, give accurate results, and possess, moreover, the advantage of being applicable to the filtration of liquids which quickly destroy woody fiber. The length of time required to dry them thoroughly, and their sensitiveness to atmospheric conditions, are their great drawbacks.

For the simple filtration of corrosive liquids without reference to a subsequent estimation of the precipitate, filters of sand, broken glass, garnets, and fibrous asbestos have for a long time been used. More recently asbestos has been moulded into the shape of an ordinary filter; in the dry state, by Löwe,** by rubbing between a hollow and a solid wooden cone; in the wet state, by Gruner,†† by grind-

FIG. 3.

ing asbestos, mixed in a mortar with water, to a pulp, transferring the mixture to a funnel choked with asbestos, inserting an accurately fitting cone of brass gauze, which presses the asbestos against the walls of the funnel, pouring off the water, carefully removing the cone, and drying the layer of asbestos which adheres to the glass. Bötiger ‡‡ has used fibers of gun-cotton; and Bunsen §§ has devised a filtering apparatus for corrosive liquids to be attached to his pump, which consists of a disk of artificial pumice fitted to a conical tube and packed around its edge with fibrous asbestos.

None of these later-mentioned methods, however, are well adapted to the quantitative estimation of precipitates.

Impressed with the desirability of further improvement in those processes of quantitative analysis which involve the use of dried filters, or the separation of filter and precipitate before ignition, I have had the good fortune, in taking the matter up in turn, to succeed in devising and preparing a felt of anhydrous asbestos, which is capable of filtering liquids with a rapidity and efficiency at least as great as may be obtained by the use of good filter paper; it is light, compact, incombustible at the highest temperatures used in analytical processes; is not acted upon by acids (excepting hydrofluoric acid) or alkalies; is sufficiently coherent to resist entirely the disintegrating action of a liquid forced through it under the pressure of the Bunsen pump, and which may, moreover, be prepared by a very simple process—in short, a filtering material which, in my belief, makes it possible to reach a high degree of accuracy in many analytical processes which hitherto have been none of the best, and to add to those already known new methods which previously have been impracticable.

My mode of preparing and using the asbestos felt is as follows:

First. White, silky, anhydrous asbestos is scraped to a fine short down with an ordinary knife-blade, boiled with hydrochloric acid to remove traces of iron or other soluble matter, washed by decantation, and set aside for use.

Secondly. A platinum crucible of ordinary size, preferably of the broad low pattern (Fig. 1), is chosen, and the bottom (Fig. 2) perforated with fine holes (the more numerous and the finer the better) by means of a steel point; or, better still, the bottom may be made of fine platinum gauze. Next a Bunsen funnel of the proper size is selected, and—following Munroe's plan for holding his porous cones—over the top a short piece of rubber tubing is stretched and drawn down until the portion above the funnel arranges itself at right angles to the direction of the stem. Within the opening in the rubber the perforated crucible is fitted as shown in Fig. 3, and the funnel is connected with the receiver of a Bunsen pump or other exhausting apparatus in the ordinary manner.

To make the asbestos felt the pressure of the pump is applied, and a little of the asbestos, prepared as described, and suspended in water, is poured into the crucible. The rubber and the crucible are held together by the pressure of the vacuum-pump with sufficient force to make an air-tight joint; the water is drawn through, and the asbestos is deposited almost instantly in a close compact layer upon the perforated bottom, more asbestos (if necessary) in suspension as before being poured upon the first, until the layer becomes sufficiently thick for the purpose for which it is intended. Finally, a little distilled water is drawn through the apparatus to wash away any filaments that might cling to the under side, and the filter is ready for use—the whole process occupying less time than is necessary to fold and fit an ordinary paper-filter to a funnel.

To prepare the filter for the estimation of a precipitate, the crucible with the felt undisturbed is removed from the

FIG. 4.

FIG. 5.

funnel and ignited. In case the precipitate to be subsequently collected must be heated to a very high temperature for a long time, it is better to inclose the perforated crucible with its felt within another crucible, because in such cases asbestos felt is apt to curl at the edges, and without such precaution some of the precipitate might drop through the perforations and be lost. For drying at low temperatures, however, and even for ordinary ignitions, a second crucible is unnecessary; but during the ignition of an easily reducible substance, care must be taken to prevent the contact of unburnt gas with the perforated bottom.

To perform the filtration, the crucible is replaced in the funnel, the pressure applied, and the process conducted precisely as in an ordinary filtration by the Bunsen pump. It is necessary to observe that the vacuum-pump is to be started before pouring the liquid upon the filter. The final drying or ignition, as the case may be, of precipitate and filter is made without difficulty or need of extra precaution.

When turbid liquids are to be filtered, or gelatinous precipitates to be separated, instead of the perforated crucible I prefer to use a platinum cone (Figs. 4 and 5), the upper part of foil (to make a tight joint with the rubber fitting of the funnel), the lower of gauze. The method of covering the gauze with felt is identical with that described above. By reason of the larger filtering surface of this apparatus, the tendency to become clogged is, of course, very much diminished. When subjected to prolonged ignition, the gauze cone is inclosed within a crucible or a cone of platinum foil.

In operations in which platinum is liable to receive injury, a porcelain crucible with a perforated bottom may be used, but recourse to this is rarely necessary, particularly when one may use the gauze cone protected as it is by asbestos felt; moreover the perforation of porcelain with numerous fine holes is a matter of considerable difficulty and expense.

Asbestos felt may be also used in the process of reverse filtering, it being merely necessary to dip the platinum rose into the asbestos mixture, after starting the vacuum-pump, in order to make the felt. The rose, with the felt attached, and the vessel in which the precipitate is collected, are to be weighed together, both before and after filtration.

Nothing can be simpler than the whole method of preparation and use of the apparatus which I have described, and its efficiency is extremely great. Clean water may, under the pressure of a Bunsen pump, be passed through a gauze cone coated with asbestos felt, which exposes a filtering surface of twenty-four square centimeters (nearly the same as that of a paper-filter, eight centimeters in diameter, when folded in the ordinary manner) with ease at the rate of a liter per minute.

When the filtering surface is less, the rapidity of filtration is, of course, somewhat diminished, but always exceeds that of paper of the same dimensions. When the felt is deposited upon gauze, the layer may be surprisingly thin and yet be efficient enough for all ordinary purposes. If the layer of felt be quite thick, the filtrate from baric sulphate freshly precipitated in the cold may be made to pass through clear. But the great superiority of asbestos felt lies in its constancy of weight, whether dried at high or low temperatures, the rapidity with which it may be safely and completely dried, and its refractoriness as regards acids (excepting hydrofluoric acid) and alkalies. These advantages appear most prominently in processes which involve the separation and desiccation—

First, of precipitates which

(like K_2PtCl_6, $[Hg_3]Cl_2$)

must be dried at low temperatures, on account of a tendency to decompose spontaneously at high temperatures.

Secondly, of precipitates which

(like Sb_2S_3, $PbSO_4$, $ZnCO_3$)

have usually been dried slowly and tediously at low temperatures, or have been separated from the filter before ignition, to avoid the danger of reduction by heating in contact with carbon.

Thirdly, of precipitates which

(like $(NH_4)_2MgP_2O_7$, $(NH_4)_2Mn_2P_2O_7$)

may be ignited in contact with carbon, but which make its complete combustion difficult.

In all cases the time required to dry or ignite precipitate and filter is a minimum, inasmuch as heat may be applied as soon and to as high a degree as the precipitate itself will permit. Even in processes in which paper filters find their most convenient application, paper has generally no superiority over asbestos felt.

To illustrate the cohesiveness and refractory nature of the felt, I append the account of a single experiment. All of the liquids used had been previously filtered, excepting the distilled water with which the filter was washed after the passage of each liquid. This precaution was considered unnecessary in the case of the water; but, if it had been taken, the slight *increase* of weight which was observed during the experiment would probably have been prevented:

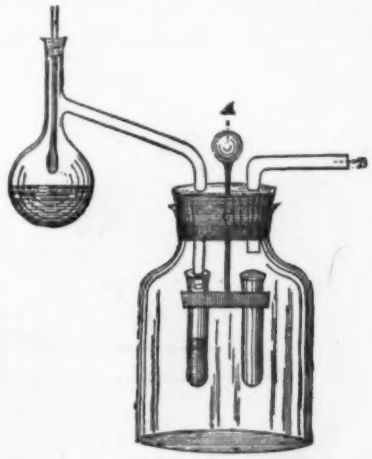
Weight in grammes of crucible and felt after ignition	20·2020
After second ignition	20·2020
After passing 100 cm^3 of strong HCl through the filter *ten* times, washing and igniting	20·2020
After passing 100 cm^3 of strong HNO_3 through the filter *ten* times, washing and igniting	20·2021
After passing 100 cm^3 of strong H_2SO_4 through the filter *five* times, washing and igniting	20·2022
After passing 100 cm^3 of a mixture of strong H_2SO_4 and water in equal parts *ten* times through the filter, washing and igniting	20·2024
After passing 100 cm^3 of water containing in solution 50 grammes of NaOH *ten* times through the filter, washing and igniting	20·2028
Weight of crucible	20·1932
" felt	0·0088

The whole process, involving in all the filtration of five liters of liquid (of which one liter was viscous), more than forty changes of the receiver, together with the ignition, cooling, and weighing of the crucible and felt seven times, was completed in two hours and ten minutes. The disk of felt was eleven millimeters in diameter.

NEW FORM OF APPARATUS FOR FRACTIONAL DISTILLATION UNDER DIMINISHED PRESSURE.

By E. J. BEVAN.

THE figure needs no explanation beyond stating that by means of the rod, A, moving, air tight, in the cork, C, any of



the tubes which it carries below may be brought under the delivery tube of the fractionating flask. The apparatus is connected at B with an exhausting pump.—*Chemical News.*

FERMENTATION.

ACCORDING to M. Pasteur, fermentation is a very common phenomenon: it is life without air, without free oxygen; and ferments, properly so called, are organisms which easily accommodate themselves to this mode of life—organisms independent of air, which grow at the expense of oxygen in combination with sugar. But moulds, generally living in the air, can themselves become ferments if they are compelled to vegetate without air. It also suffices to immerse saccharine fruits in carbonic acid gas to produce a spontaneous alcoholic fermentation, by a kind of perversion of the chemical process of nutrition, which is afterward kept up by means of the oxygen of the sugar. The vegetable cellule, instead of elaborating sugar, lives upon that which exists in the fruit, and transforms it into alcohol. Grapes, melons, oranges, if confined under a bell-glass filled with carbonic acid, ferment at once, though no trace of yeast can be discovered in the pulp of these fruits. While plums exposed to the air become very soft and sugary, the same plums in carbonic acid gas become firm, hard, lose much sugar, and, if distilled, yield alcohol. Hence there is every reason to believe that fermentation is nothing more than an example of nutrition by means of combined oxygen; but it must be added that free oxygen is necessary for commencing the fermentation by awakening the vital activity of the ferment.

* Read before the American Academy of Sciences, Feb. 13, 1878.

* Am. Jour. [2], vol. xliv., p. 215.

† Am. Jour. [3], vol. i., p. 1.

‡ Zeitschr. f. Chem. [N. F.], Bd. 6, p. 481.

§ Am. Chem., vol. v., p. 441.

‖ Proc. Am. Acad., vol. xii., p. 194.

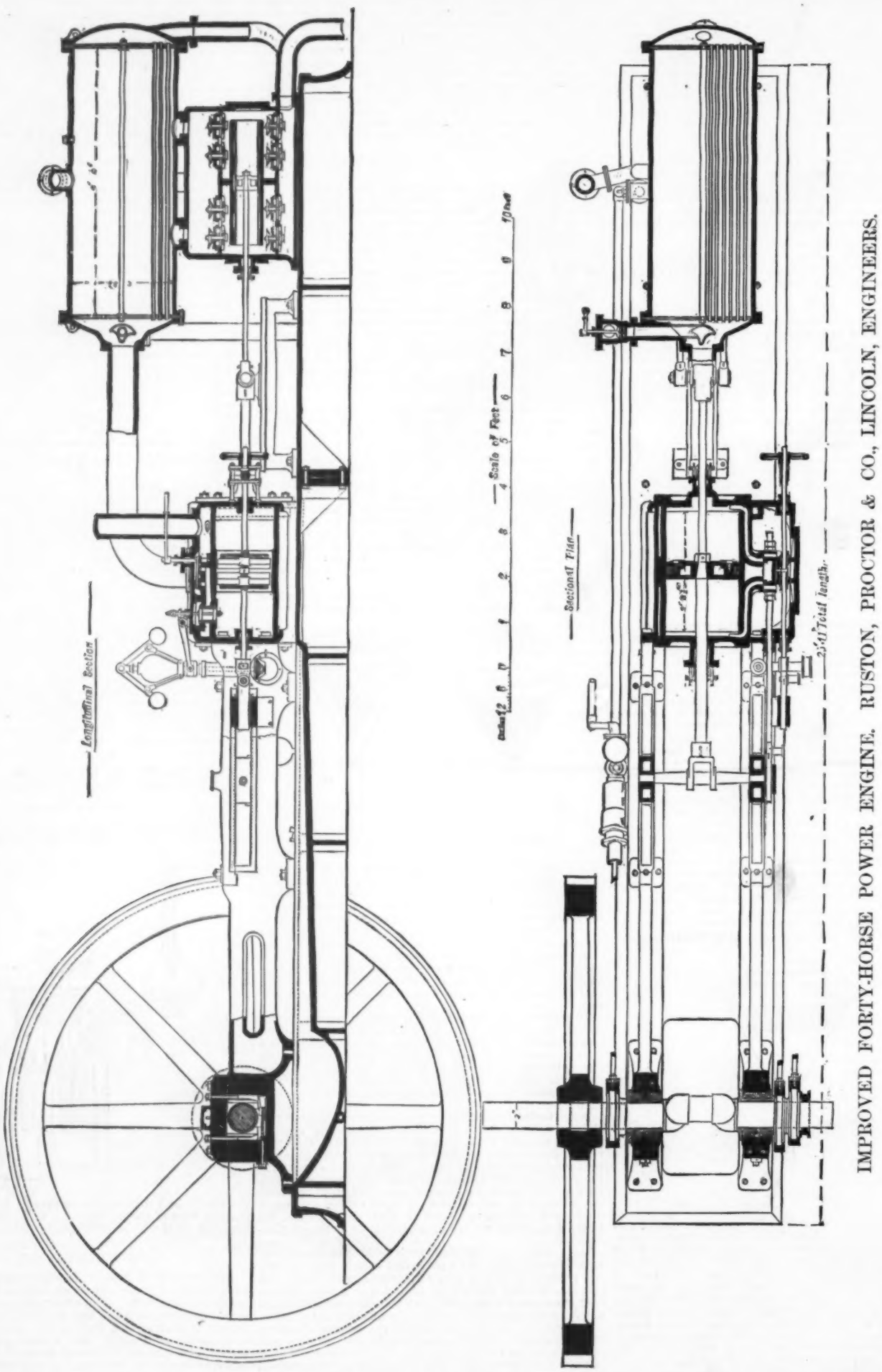
¶ Am. Jour. [3], vol. i., p. 247.

** Dingl. pol. Jour., cxlviii., 444.

†† Jahresb. Chem., 1860, p. 900.

‡‡ Dingl. pol. Jour., clv., p. 463.

§§ Ann. Ch. Pharm., cxlviii., p. 290.



IMPROVED FORTY-HORSE POWER ENGINE. RUSTON, PROCTOR & CO., LINCOLN, ENGINEERS.

IMPROVED FORTY-HORSE POWER ENGINE.

THERE are many situations wherein the economy which may be gained by the use of a condenser has been lost because a sufficient supply of fresh water was not available, though proximity to the sea provided plenty of salt water. These conditions as to water supply characterized the site of a large corn mill recently fitted up abroad by Messrs. Ruston, Proctor & Co., of Lincoln, Eng., but it was determined to secure the advantages of condensing by using a surface condenser and sea water.

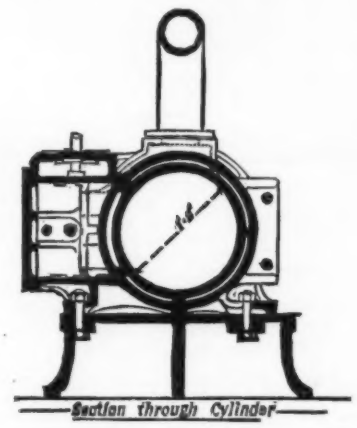
The engine is of the horizontal class, and in general design is a combination of what are commonly known as the "girder" and the "bed-plate" types, the former being that introduced into this country by the Corliss engine, and the latter that which has always been common to horizontal engines. By means of the combination here employed, the advantages of the two types are obtained in such a manner as to avoid the disadvantages which belong to both. In the girder type the disadvantage consisted in the independence of the two main crank shaft bearings, so that the accuracy of their position depended so much upon the foundations and upon the care of the workmen employed in setting. With the bed-plate of the common type, and, if of considerable length, the depth necessary to secure rigidity, involved great weight, and firm connection to a heavy block of foundation masonry was necessary to prevent injurious springing. In the form illustrated, the rigid connection between cylinder and pedestals prevents strains of the latter kind, while the advantages of having both bearings rigidly fixed in accurate relation with the cylinder and girders is also secured.

The two small girders which form the crosshead guides are each cast in one piece with a pedestal, and are attached to the cylinder by bolts drawn up tight with cotters, and also bolted to the bed-plate. They are planed out to a channel section at the part which forms the bottom guide bars, the top ones being bolted on. The crosshead blocks are provided on this under side with a flat steel gib, fitting the channel of the slide bar, arranged to be easily packed or adjusted in case of wear. The left-hand frame, or girder, supports the valve spindle guides, which are also made adjust-

able. It also carries the governors, which are of the Porter type, and act directly, by means of a lever of the first order, on the spindle of the equilibrium throttle valve. The stop valve is combined with this valve in the cylinder casing, and by the arrangement of its chamber and drain passage condensed water from the steam pipe is prevented from collecting and being blown through into the steam chest. The steam jacket is fed by a side branch from this chamber, and is also suitably drained.

The expansion valves are of the Meyer type, cutting off from $\frac{1}{16}$ to $\frac{1}{2}$ stroke, with an adjusting hand wheel at the back of the steam chest. The cylinder is 20 ins. in diameter and the stroke 30 ins.

The air and circulating pumps are placed side by side behind the cylinder, and have their piston rods connected to the continuation of the engine piston rod through the back cover of the cylinder. To prevent any detrimental effect from a slight inequality in the load on these pumps, a guide



Section through Cylinder

with large wearing surfaces is provided. The surface condenser is cylindrical, situated immediately above the two pumps, with passages for the circulating water, which enters at two ports at the bottom, and, after passing round the outside of the tubes, leaves by the pipe at the top. The tubes, of which there are 618, are $\frac{5}{8}$-in. internal diameter and 6 ft. in length. They are secured at either end into rolled brass tube-plates by screwed brass glands and hemp packing.

The condenser covers are easily removable and are dished, the front one forming a trumpet shaped continuation of the eduction pipe, just behind which is a hollow cone-shaped casting, pierced with holes round its edge and in connection with the auxiliary injection pipe, which is made large enough to act as an ordinary jet condenser in case of need. With these jets of water issuing divergently from these holes the steam becomes intimately intermixed and efficiently condensed. A simple bend connects the back cover with the air pump, which, being beneath, thoroughly drains the condenser. The barrels of both pumps are lined with gun-metal, and the pistons, valve seats, and guards are also of the same material. The valves are circular and of India-rubber. The sea water flows into a well in the engine house, through about 120 yards of 12-in. sanitary pipe, and from this well the circulating pumps draw a supply, and also from a large fresh water underground reservoir arched over and situated between the engine and boiler houses. This reservoir supplies the injection water when the condenser is thus used, and the boiler donkey pump; it also affords, in case of repair to the sea water pipes or cleaning out the well, a temporary supply of circulating water, suitable valves being fixed for this purpose. The overflow pipe from the condenser is joined by that from the hot well, which of course is ordinarily out of use, and passes outside to a drain running directly to the sea. The whole condensing arrangement being in sight above ground, every part is easily examined, and nothing can get out of order without being at once noticed. The boiler, of the Lancashire type, is 7 ft. diameter by 30 ft. long, has two flues 2 ft. 7 ins. diameter, with ten Galloway tubes, and is provided with most complete fittings. Passing now to the gearing for giving motion to the mill—at present fitted with eight pairs of 4-ft. stones—it will be noticed that teeth are cast on the fly-wheel rim; these gear into a large mortise spur wheel keyed to a countershaft, on which is also a mortise bevel wheel, gearing into a similar sized wheel keyed to the main shaft; this runs at 107 revolutions, the engine making 60 per minute. These two shafts at their inner ends are supported by plummer blocks bolted to a strong triangular casting, held down to a block of stone work. Sole-plates, also let into stone, carry the outer ends of the counter and crank shafts; the latter is 7 ins. diameter and bent from a bar. Throughout the design great care was taken by the makers to insure completeness and durability, special care being taken to secure facility for repairs and inspection.

In view of the distance and inaccessibility of the mill site, and the consequent importance of facility of erection, all details of the engine and connections and machinery, were put together in the workshops before being sent away, with the result that everything was fixed without any difficulty or hitch, in accordance with drawings supplied by the makers, and the whole is now in successful operation.—*Engineer.*

HEAT IN THE DEEP GOLD MINES.

THERE is still one very hot place ahead in the Savage mine. It is in the 2,200 level. In approaching that point the heat will be so great in the incline that it will be almost beyond human endurance. It is now intensely hot below the 2,100 level, but the heat will be very much greater before the 2,200 level is drained. The heat and steam now ascending are only from the small surface of water exposed in the incline. The critical time will be when the water begins to fall away from the roofs of the long drifts and other openings on the 2,200 level. Then the steam and heat rising from a great surface of water will move to the incline, up which it will rush in seething, blinding volume. At present the steam is kept back and only escapes from the comparatively small surface exposed in the incline. In approaching the 2,000 level the workmen in the Savage experienced something of what will be seen at the 2,200. As the water began to recede on the 2,000 level a great amount of surface was exposed, from which rose a vast deal of steam and heat, all of which poured up the incline on its way to the surface. While the level was in this condition it became necessary to connect a pipe with the donkey pump. The men sent down to do this work several times advanced to the pump, but as often retreated, finding it impossible to face the scalding and blinding heat. They finally declared that there was no use in trying to make the connection—that no human being could face the heat. Being determined not to be beaten out of the incline, the foreman finally induced a man to go down the incline with him and assist in nailing a sheet of canvas across the compartment just below the point where the pump was standing. The canvas was nailed up, and it served such good purpose in turning aside and shielding the men from the direct current of heat and steam that they were able to make the desired connection. While holding up the canvas to nail its upper corners the foreman had the back of the fingers of his left hand scalded to a blister. In approaching the 2,200 level the same great heat will no doubt be encountered. It was not noticed at the 2,100 level, as there were no large openings at that point, nothing but a station.—*Enterprise.*

[It would seem from the foregoing that if some means could be invented for drilling still deeper, and then feeding in a suitable quantity of water, heat and steam enough to drive all the mining machinery might be attained.]

ENGINEERS' CLUB OF PHILADELPHIA.

Philadelphia Water Works.—At the last meeting of the club, Mr. Henry G. Morris made some very interesting remarks in regard to the proposition which Messrs. William Cramp & Sons have made to the Philadelphia Water Department. They propose to furnish steam pumping machinery and foundations, boilers and air-vessels complete, with all valves and attachments, inside the house, to the pumping mains proposed to connect with the distributing pipes of the Belmont Water Works, on the east side of the Schuylkill river, and operate the same.

They also propose to furnish all coal, stores, and supplies, provide attendants and maintain repairs free of all charges to the city in the first cost and operating expenses, for the same sum per million of gallons pumped as it now costs at the Belmont Works, that being the lowest cost in the list for steam pumpage.

At the expiration of five years from the time the machinery is started it shall become the property of the city of Philadelphia, without further cost or expense; grounds and houses to be furnished by the city and located at the Schuylkill Works; the Department to so arrange its pipes that any excess of pumpage not required on the east side can flow into the Belmont Basin, in order that continuous pumpage can be maintained; the machinery to be capable of pumping 14,000,000 gallons per twenty-four hours; the quantity of water pumped to be determined by the method now used by the Department, and payments to be made quarterly on quantities certified by the Chief of the Department.

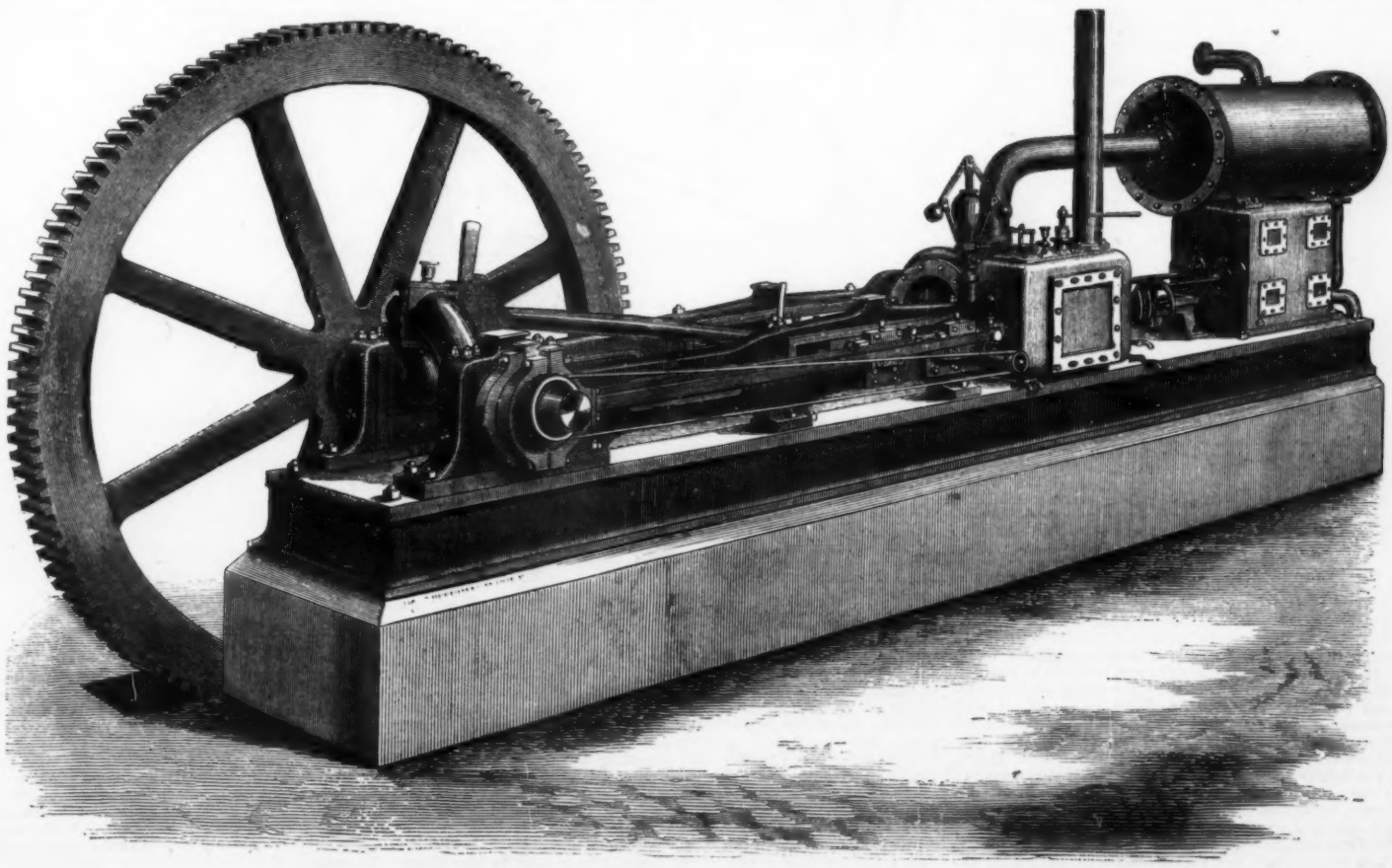
The cost at the Belmont Works, the cheapest of any of the works in the city, for pumping 1,000,000 gallons 200 feet high, was, in 1877, $14. The Messrs. Cramp have stated that they are satisfied that by using their own engines they can supply the 14,000,000 gallons every twenty-four hours at the same rate as now done at the Belmont Works—$14.12—and still make a good profit.

Mr. Morris gave an estimate of the cost at which the work could be done, and, by comparison with the duty of the Lowell engines, showed approximately what profits might be expected. At Lowell, Mass., the cost was, in 1877, $10.71 per 1,000,000 gallons for raising water into reservoir, a height of 166 feet, with the Morris engine.

Petroleum Pipe Lines.—Gen. Herman Haupt made very interesting remarks in regard to the Seaboard Pipe Line. About two years ago the Pennsylvania Transportation Company called upon Gen. Haupt for estimates in regard to cost of transporting oil to the seaboard by means of pipes. The first pipes in the oil regions for the transportation of oil were laid fourteen or fifteen years ago. At present there are some 2,000 miles of pipe in operation between the wells and the railroads.

At first the pipe line companies met with a very determined opposition from the teamsters and boatmen, but after waging a bitter war against the new system they had to succumb, and pipe lines became the only mode for conveying oil from place to place. The Legislature passed an act allowing pipe lines in four or five of the western counties. The Conduit Line was started to operate between the oil regions and Pittsburg. After a sharp contest with the Pennsylvania Railroad it succeeded in getting across the line of the railroad by using a public road. The oil was received in tanks which were mounted on wheels, hauled across the railroad, poured into receivers, and went on its way to Pittsburg. Even with this extra expense of handling the line paid well.

Upon visiting the oil regions it was found impossible to



IMPROVED FORTY-HORSE POWER ENGINE.

get satisfactory data for formulating the hydraulic pressure and making necessary calculations for an estimate of cost for a long line. The Seaboard Line propose to use a 6-inch pipe, which will give a capacity of 6,000 barrels discharge per day; the line will be tested to 1,800 lbs. pressure per square inch and worked at 400 lbs. per square inch. Preliminary surveys have already been made. The first station will be located at Parker City, from which the oil will be forced a distance of 35 miles; the second pump will force it 26 miles further; the third pump 70 miles further; and the last pump, which will be located on the west side of Tuscarora Mountain, will send it to Baltimore, a distance of 102 miles. The pressure at each station will be 400 lbs., equal to a head of 1,200 feet of oil—distances between stations varying with the profile of the ground crossed.

The estimated cost of transportation is one cent per barrel at each pump, the distance between pumps being immaterial. Five cents per barrel is a full estimate of cost for transportation from the oil regions to the seaboard. A 6-inch line of pipe can be made at a cost of $8,000 per mile, making the total cost of the projected line $1,750,000. Construction of the Seaboard Line will be commenced in two or three weeks.

One of the most important points in the construction of pipe lines is to allow for contraction and expansion due to changes of temperature.

A pipe line is certainly the most economical and natural method for transporting fluids, and there is no more reason why oil transported in pipes should be exported than when transported in cars.

FLOATS FOR DOCKING SHIPS AND RAISING SUNKEN VESSELS.

FLOATS FOR DOCKING SHIPS.—The diagrams show the general form of the dock Fig. 1 representing the plan, and Figs. 2 and 3 the side and end elevations. The iron portion of the structure resembles generally the improved form of dock known as Clark & Standfield's Tubular Dock, but with a bottom of unusually shallow depth to give lightness of draught. It differs from the old form of floating dock in having vertical tubes at the sides, and in other particulars which need not be here mentioned. The general plan represents a dock with a vessel in it, one-half the vessel being omitted in order to show the position of the air cushions, *a a a*, and the keel blocking on which the vessel is partially supported; an end view of the air-cushions is also shown in Fig. 3, with the vessel resting upon them. The construction of these cushions is well understood, as they have in other forms been extensively used in Russia and other countries; they are composed of layers of stout canvas embedded in vulcanized India-rubber, and are usually designed to support a pressure of thirty or forty lbs. per square inch, but can be made to support very much higher pressures. They are capable of withstanding very rough usage, but are protected from wear by being enveloped in matting or thick rope netting. They are inflated by air compressed, worked by four engines situated in the sides of the dock, and are each provided with valves opening outward, which are kept closed by springs so adjusted that whenever the pressure exceeds a certain regulated maximum, the surplus air escapes without injury to the bags.

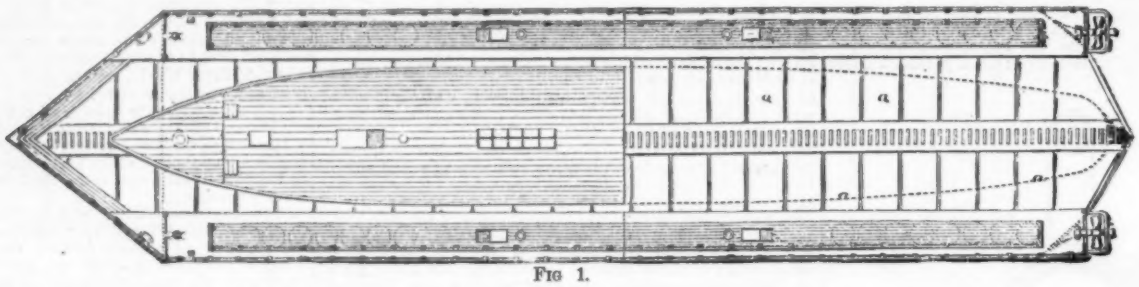


FIG. 1.

In docking the vessel a certain number only of the cushions are partially inflated, and these are provided with extra wooden fenders inclined to an angle, so that when the vessel strikes or rests on any of them they tend to throw her off toward the opposite cushions, and to lead her toward the center of the dock; one or two buffer cushions at the sides are also arranged to assist in the same object, and to neutralize the shock of collision. The moment the vessel is centered or nearly so, the valves are opened and the cushions expand, causing the dock almost instantly to support the vessel, and horizontal shores or thrust blocks (shown at *b b*, in Fig. 3) are screwed up against the sides to hold her in position. The pumping is further continued till sufficient water is expelled from the dock and the air-cushions, and the vessel floats at the required level.

It is obvious that the vessel is supported everywhere on a kind of air-bed, almost as completely as if she were afloat, and therefore heavily laden ships or vessels carrying loose grain, etc., may be as safely docked as empty ones.

The air blocking has a further advantage, inasmuch as by its back pressure against the sides of the dock it entirely relieves the bottom of the dock of the breaking strain which would under other circumstances be caused by the weight of the vessel resting on the keel blocks, and therefore the bottom can be made much shallower than would otherwise be possible, and thus obtain a lighter draught. The stability of the dock and vessel combined is obviously five or six times greater than that of the vessel alone. The lowering of the vessel into the water is of course effected by allowing the bags to collapse, and the water to enter the chambers of the dock till it floats at its lowest level, ready to receive another vessel.

It is not necessary to say much as regards the strength of the air-bags, as they are already well understood; the bottom of each cushion is of iron, and the cushions lie back in iron recesses when not inflated; they can readily be made to support a pressure of forty or fifty lbs. on the square inch,

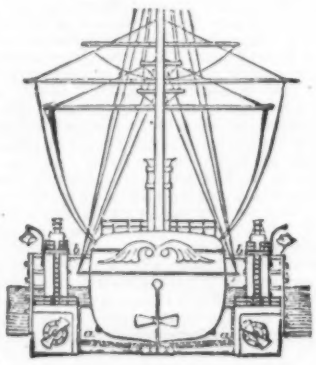


FIG. 3.

but the safety valves limit the maximum pressure to ten or twelve lbs. A vessel drawing twenty ft. of water is subject to an upward pressure of about ten lbs. per square inch on her bottom, and therefore this pressure on the air-cushions beneath her would support her entire weight; but as she will rest to a considerable extent on keel blocks the pressure on the cushions will be by so much reduced. Any cushion can be allowed to sink back into its recess and there be temporarily planked over so as to allow access to the vessel for examination or repairs, and it is obvious that the whole of them can be removed one by one, and ordinary bilge-blocks substituted in their place, converting the whole into an ordinary floating dock for painting and repairs. The ship-float is provided, among other appliances, with twin screws, which are worked by the same machinery as the air compressors, and which, with the assistance of the screw of the vessel, will give it a considerable speed; and certain of the vertical tubes being hermetically closed, it can never under any circumstances sink below a certain predetermined level.

The air-cushions and bilge-blocks are above described as adapted only for use on ship-floats, but they are equally suitable for use on floating docks and in ordinary stone or wood graving docks, affording an equable support to the vessel, and preventing any undue strain from coming on the keel or bilges; the great difficulty of causing ordinary blocking to fit accurately under a vessel so as to produce no undue strain is thereby entirely avoided. In the case of stone docks, each cushion is fitted on a separate sliding shutter or frame, so that it can be readily drawn back to allow access to the ship, and in preference of being inflated with air it is filled with water, so as to constitute a kind of water-bed for the vessel. In ordinary graving docks a reservoir of water at the ground level would just produce about sufficient hydrostatic pressure to afford the necessary support, the whole of the bags being kept in free communication with the reservoir, so as to equalize exactly the strain upon the whole of them; by giving a slightly increased pressure, the vessel may be easily and safely lifted off her keel should circumstances require it. The equable support thus given to the bilges and sides would be of great value in the case of heavy armor-clad vessels or of injured vessels containing a full cargo.

The constant renewal and destruction of timber blocking occasions a heavy expense, which would be greatly reduced by the use of air or water blocking.

RAISING SUNKEN VESSELS.

Messrs. Clark & Standfield, having carefully studied the subject, arrived at the conclusion that ship raising should be carried out on a large scale by a single machine capable of raising ships of all sizes, and that it should be large enough and powerful enough to grasp the vessel bodily from the outside without the intervention of ropes or chains and without the assistance of divers.

It will be seen from the diagrams that the apparatus Messrs. Clark & Standfield employ is practically a submarine dock, somewhat resembling an ordinary floating dock inverted. It is sufficiently large to be submerged over the vessel intended to be raised and entirely to cover it. The breadth inside must therefore be greater than that of the vessel, but the length may be either greater or less, according to circumstances.

The two sides of the dock are each constructed in one continuous length and form two hollow box-girders; their cross-section is triangular, as shown in the diagrams, the apex being downward and forming a knife edge intended to rest on the bottom; the two sides are connected together at the top by a number of transverse box-girders, A, A, A, placed at suitable distances apart, adjusted according to the position of the masts or other obstructions on the deck of the vessel. These girders are very firmly attached to the sides by numerous and powerful bolts, allowing them to be shifted laterally, and also allowing the sides of the dock to be placed nearer together or further apart, according to the breadth of the vessel to be lifted. These adjustments are, of course, effected in harbor before proceeding to the scene of operations.

At the four corners of the dock rise four cylindrical columns of large diameter (say 20 ft., more or less), the tops of which are always considerably above water, even when the dock is submerged over a sunken vessel. These columns rise from the transverse girders at the ends of the dock, which are made of suitable breadth to accommodate them, and they are braced together in pairs and connected by a bridge.

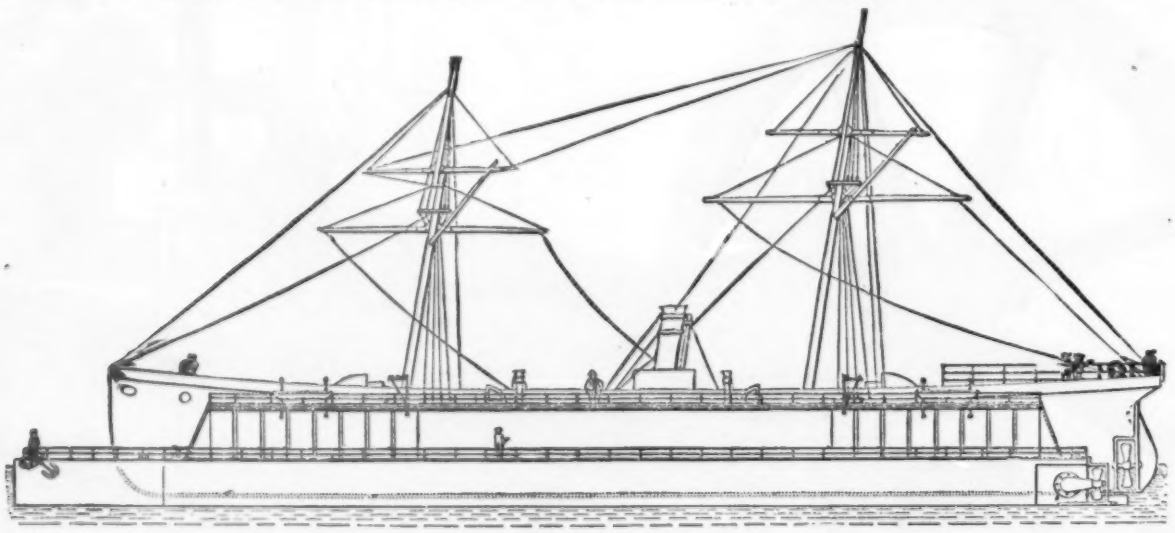


FIG. 2.—FLOATS FOR DOCKING SHIPS.

They contain the engines, pumps, and machinery, and to give them greater strength they are, up to a certain height, made double—that is to say, they consist of two concentric cylinders, the space between being divided into cellular compartments.

The whole structure is built of hollow riveted iron work, and, when empty, is extremely buoyant, the sides alone being more than sufficient to float the whole. When it is desired to submerge the dock over a vessel water is admitted first into the sides of the dock and subsequently into some of the transverse girders, and, if necessary, into the vertical cylinders; the dock is thus allowed to sink gradually in the water until only the four vertical columns remain above the surface. The operation is further continued until the dock

is sunk over the vessel, either resting upon its deck, or the knife edges of the sides resting upon the ground, as shown in Fig. 6. Assuming for the moment that the vessel is upright and free from any accumulation of sand, it becomes necessary to grip the vessel. This is effected in the following manner: A number of grapnels or curved-iron clutches, B B, fitting approximately to the sides of the vessel, are hinged at top to the sides of the dock along its whole length.

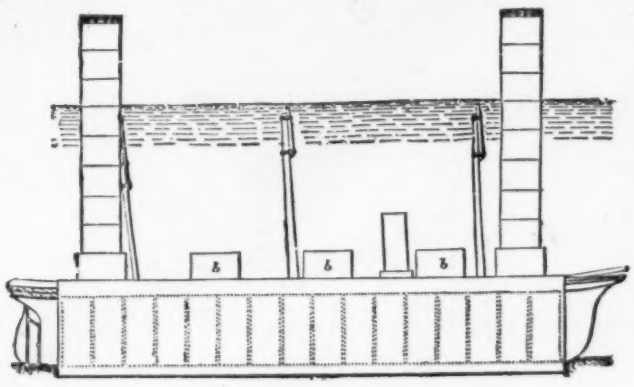


FIG. 4.

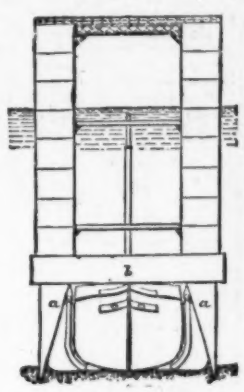


FIG. 6.

They are each 10 or 12 ft. broad, constructed of hollow wrought-iron plate, and are of great strength; during submergence they lie back close against the sides of the dock. Each of these clutches can be thrown forward at pleasure by the inflation of a large air-bag, C C, secured to its back and resting behind it against the side of the dock. A single pair of these clutches, situated near the middle of the vessel, is first thrown forward and caused to grip the vessel; a second pair is then similarly brought into bearing, and the remaining pairs in succession; each pair of clutches, as the latter take their grip, is held in position by ratchets and pawls behind in such manner that the clutches cannot be forced back again; this is to give them additional support when the strain of lifting comes upon them. It will be observed that the curve given to the clutch gives it a secure bearing beneath the bilges of the vessel. At the stem and stern, air-bags without clutches press up beneath the vessel and afford additional support. In this condition of things it is evident that the dock and the vessel are firmly united, so as to form practically one structure, and the buoyancy of the bags alone will in many cases be sufficient to cause the whole structure to begin to rise; should they not do so, water is forced out of the cross-girders, and, if necessary, out of the hollow sides, until the vessel rises; as soon as it begins to float it would come entirely to the surface were it not that the four large cylinders, as they emerge from the water, reduce the buoyancy and so prevent the dock from rising too suddenly.

As the bags approach the surface the external pressure of the water upon them is diminished and their internal pressure is increased; in order to relieve this they are provided with the usual pressure valves, opening outward and adjusted by springs to such a pressure as is deemed best for gripping the vessel; this pressure can never be exceeded, as the surplus air escapes through the valves into the sides of the dock, or, if its buoyancy is not wanted, into the open water.

The engines and air-pumps are of very great power, so as to perform their functions rapidly, and are four in number, situated one in each of the four corner cylinders, and pipes lead from them through the sides to every compartment of the dock; each is, of course, provided with a pressure indicator, as the pressures are sometimes excessive, amounting in some cases to 70 pounds or 80 pounds on the square inch; the pumps are duplicated and so arranged that they can either work in conjunction or can each work separately under half pressure—that is to say, one can pump into a pressure chamber at thirty-five or forty pounds pressure, and the other work out of this chamber at full pressure; even in ordinary use a large space is devoted to air-chambers, in which a store of air is accumulated under pressure ready for immediate use, so that the grippers, for example, can be closed at a moment's notice.

We will now suppose that, instead of the vessel lying in clear water, it has sunk into the sand or mud, or become surrounded with sand; on lowering the dock the knife-shaped edges of the sides will rest on the sand in some uneven position, too high to permit of the vessel being properly gripped; in order to afford means for removing this sand, the bottom edge of the sides is divided into compartments, and each compartment has a number of holes close to the lower edge; the compartments being full of water, a large reservoir of compressed air is suddenly turned upon the water, which drives it out of the apertures with great violence, stirring up the sand and washing it away, and allowing the dock to settle down to a lower level until it either rests on the bottom or bears on the deck of the vessel.

The center pair of clutches is now caused to grip the vessel, the sand being driven out before them by a rush of water, as just described; a second pair is then caused to grip in the same way, and so on till the whole are secured; the clutches themselves, which are of hollow boiler-plate work, have also orifices at their points through which powerful jets of water are forced in order to clear their way through the sand, or, if preferred, they may be used as sand-pumps, water and sand being sucked in in front and discharged behind.

If the vessel does not lie on an even keel the dock has to be lowered in a slanting position by admitting water at one side, but not at the other (Fig. 7); when passed over the hull of the vessel she is clutched temporarily, and by giving buoyancy to one side only she is first brought to an even keel, and either raised to the surface or gripped a second time in her upright position. The vessel, when raised, is floated away to a tidal harbor and repaired or broken up. In the case of a vessel with a hole in her sides or bows, such as that in the Vanguard, an attempt would, of course, be made to fit an air-bag directly over the aperture, and as the dock would be furnished with powerful pumps, water might be pumped out of her compartments while she was being towed to port.

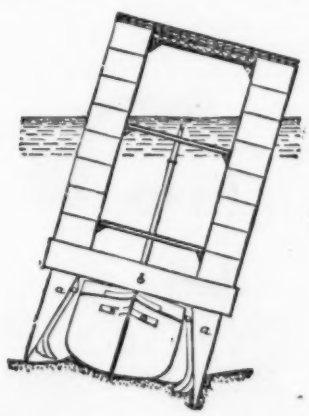


FIG. 7.

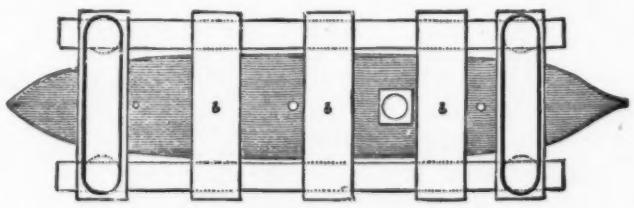


FIG. 5.—FLOATS FOR RAISING SUNKEN VESSELS.

We may now consider the degree of pressure required on the air-bags to give an effective grip. A vessel drawing 20 ft. of water has, when afloat, an upward pressure of about 10 lbs. per square inch over her whole bottom surfaces. Disregarding her loss of weight when in water, and assuming that the air-bags bear against over one-half her bottom area and support the whole weight, we should require a pressure upon them of about 20 lbs. per square inch to raise her; but this assumes that the powerful framed iron grippers support no portion of her weight, whereas they are strong enough to support the vessel without assistance; the weight is therefore borne partly by the grippers and partly by the upward pressure of the air-bags. The bags are made of several layers of stout canvas and vulcanized India-rubber, and are easily able to withstand a pressure of 30 or 40 lbs. per square inch, or, if inclosed in netting, a much higher pressure. They are protected from injury by stout matting or thick rope-netting.

The sides of the dock contain a passage running along their whole length, provided with stout glass eyes at intervals, so that the operator, provided with a powerful light held against one of them and looking through the other, can descend and examine any obstructions or see the position of the ship in respect to the dock, and so regulate its descent. By means of these passages one is enabled to get from column to column, and, in fact, all round the dock, without coming to the surface.

In order to adjust the distance asunder of the sides and the position of the top girders, the whole dock is floated on to a framework in harbor, of such a height that the girders rest on the frame at the same time as the sides of the dock rest on the bottom; by unfastening the ends of the girders at opposite sides alternately, and keeping the sides nearly afloat, any adjustment of width and position may be effected.

Owing to its peculiar form its stability is so great that, if forced down purposely on to its beam ends, it would right itself instantly, and with great power. When sunk over a vessel only the four cylinders would be above water, and from their small area and great strength they would withstand the heaviest storms without danger or injury. In raising a vessel no divers are required and no chains or attachments have to be made; she is supported under the bow and stern as well as under the bilges—the points where the weight of her cargo chiefly rests, and where she is best fitted to withstand the strain; the lift, in fact, takes place among the whole of her length from stem to stern. The operation under favorable circumstances may be effected in a single tide, and the apparatus ought in average weather to raise at least two ships every week.—*Marine Engineering News.*

A NOVEL BRICK KILN.

AT Normanton, England, Mr. Foster has a kiln that is said to work perfectly. The kiln is a little more than one hundred feet long and is only eight feet broad. Through this kiln is laid a track, on which travel iron cars, whose iron-work is protected from the fire by burned clay, by the current of fresh air which is drawn under them by the draught, and by not being fully exposed to its fury, in that the cars are on a lower level than it. This fire is in the middle of the kiln, on either side of the track, and as the chimney-flue is at the entrance end, the fire is drawn to meet the entering car, with its load of five thousand raw bricks, and thus gives them a preliminary drying and baking before they are exposed to the full heat of the fire, and also allows them to begin to cool off as soon as they have passed the middle. The kiln will contain nine cars—or, in other words, 45,000 bricks—and as the bricks are unloaded from the cars directly into wagons, the progress of the line of cars is slow enough to allow the bricks to cool thoroughly after passing the fire. There seems to be very little heat wasted, for the cars are just the width of the opening of the kiln, and their load of bricks reaches quite to the top of the arched passage. At any rate, as the cost of burning one thousand bricks is said to be less than six cents, the process cannot be called an expensive one.

AMERICAN ESSENTIAL OILS.

WE take the following items from a report on the Philadelphia Exhibition, published by M. Achille Jonas, delegate from the Belgian Government. After mentioning the several exhibits the author says:

The oils stamped "H. G. Hotchkiss" are the most esteemed. We apply ourselves to them especially as representing perfect specimens of American volatile oils.

More than 4,000 acres of land have been employed in the United States in the cultivation of peppermint. This plant needs suitable sun and assiduous care, and it frequently happens that by neglect in cultivation all kinds of strange herbs increase among the plants of mint—considerable quantities of broom weed, or mares' tails, being among them. The seeds of this plant furnish by distillation a considerable proportion of volatile oil, which impairs the naturally fresh, penetrating, and delicious taste of the oil of peppermint. Moreover, the American peppermint oil is very often adulterated with oil of turpentine, which is added during or after distillation. The oil of peppermint of H. G. Hotchkiss is, on the contrary, much esteemed and known throughout the whole world, and for more than thirty-five years it has been in all the Universal and International Exhibitions the object of the most serious observation, and the manufacturers have above all gathered the most flattering praise as well as the highest honorary awards, and, let us add, the most deserved ones.

Mr. H. G. Hotchkiss commenced the cultivation of mint in 1841, in the neighborhood of Lyons, Wayne County, New York. He produced at first 1,000 to 2,000 lbs. annually, and, thanks to his intelligent method of cultivation and the minute care which he employed in the distillation of the plants, the oil of his stamp was soon celebrated as the finest, the purest, and the best in the United States. Mr. H. G. Hotchkiss afterward extended this industry considerably. He has made large new plantations, and a great part of the land which he purchased can be submerged at will during the winter in order to preserve the plants from the severe cold. Hundreds of laborers spend their care upon the fragrant herbs which cover this large property. One acre of land produces nearly 20 lbs. of mint, and Mr. H. G. Hotchkiss sends yearly more than 50,000 lbs. (the American pound is 453 grammes) of this valuable liquid to his different agents, who distribute it through the whole world.

In the pure state the oil of American mint is colorless, clear, and possessed of all the properties of the English oil, except that its odor and its taste are a little less pungent. Nevertheless large quantities of this oil are exported to London, of which a great part is purified by the process which we have before described in speaking of the Mitcham oil, to be rectified some years after its sale, and marked as an English product.

The oil of peppermint loses its herbaceous odor by age, and its aroma becomes more delicate; but after a certain number of years it thickens, and its color becomes reddish-yellow. Exposed for a long time to the air it finally becomes entirely resinous, though Mr. H. G. Hotchkiss exhibited an oil preserved for more than thirty years shut up in glass bottles covered with a skin, the color of which was very dark, its odor, however, being characteristic, and its taste fresh, and partaking strongly of the peppermint herb.

WE note that the Huddersfield Dyers' Scientific Society celebrated their sixth anniversary on Saturday, April 6th. As we observed recently that a similar society in Berlin held their third anniversary but a few months ago, it is satisfactory to be assured that in one thing at least, viz., the establishment of such institutions, England may claim the merit of priority. We pointed out in an exhaustive article in our February number the need and advantage of these societies, and we hope, before long, to place it on record that other towns in our manufacturing districts have followed the example so worthily set by Huddersfield.—*Textile Manufacturer.*

ACCORDING to Reimann, sulphuric acid free from water is now being supplied to the trade in a crystalline form, inclosed in tin boxes; by that means the cost of carriage is considerably lessened. It is also especially useful for the manufacture of artificial alizarine.

IT is reported that a forest of sanderswood trees has been found in one of the Fiji Islands. Should this prove correct, the discovery will, no doubt, have some influence on the price of this valuable dyewood.

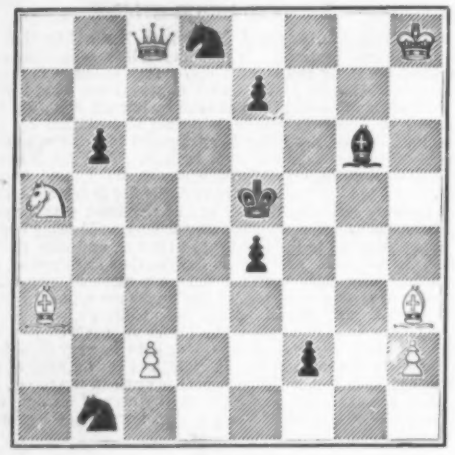
SCIENTIFIC AMERICAN CHESS RECORD.

[All contributions intended for this department may be addressed to SAMUEL LOYD, Elizabeth, N. J.]

PROBLEM No. 92. BY W. H. ATKINS.

Prize Set of the Onondaga Tournament, 1858.

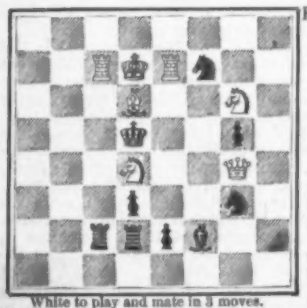
Black.



White.

White to play and mate in three moves.

W. GRIMSHAW, OF ENGLAND.



White to play and mate in 3 moves.
To W. B. DEAN, ASSOCIATION TOURNEY.

DESIRING that our English cousins shall be duly represented in our gallery, we take special pleasure in calling attention to the genius of Mr. Grimshaw, famous the world over for his brilliant conceptions, and in our humble opinion the most original composer of Europe.

We scarcely find that certainty of exquisite finish that Mr. Healy bestows upon his problems, and which is so necessary for tournament competition, but we have never yet seen a problem by Grimshaw that did not possess an original sparkle that is peculiarly characteristic of this distinguished composer.

Although Mr. Grimshaw is one of the strongest English players, he takes more pleasure in the art of composition, and is as prolific as he is original, having long been recognized as one of the masters.

The following specimens of his skill we remember to have seen some years ago, although they are not equal to some of his more recent compositions:

ENIGMA No. 58.—BY W. GRIMSHAW.

White.—K on K R 5, R Q R 2, Bs K B sq and Q R sq, Kt K Kt 6, Ps Q 4 and K Kt 2.
Black.—K K 5, Ps Q 3 and 4, and K B 3.
White to play and mate in three moves.

ENIGMA No. 59.—BY W. GRIMSHAW.

White.—K on Q 7, Q Q Kt 2, R K Kt 2, Kt Q R 7, Ps Q Kt 4, K B 4, K Kt 3, K R 3.
Black.—K Q 4, B Q Kt 3, Ps Q B 5, Q 5 and K 5.
White to play and mate in three moves.

NOT A GAMBLING GAME.

IT is the acknowledged opinion of all chess devotees, among whom are many reverend divines, statesmen, and scientific men, who have examined into the mysteries of chess, that of all games it is the most unfit for gambling purposes, and has the effect of withdrawing a player's interest from other games. A fact significant of the truth of this assertion is contained in a statement, made on the authority of many steamboat captains, that, owing to the late chess excitement, "card playing among travelers in the West has diminished one-half, and chess has taken its place."

While speaking of chess as opposed to gaming, we will take occasion to relate one of the means by which that good and holy man, St. Francis Xavier, is known to have gained the love and esteem of every one, and to have made over 700,000 converts from among gambling dens, barracks, docks, prisons, and wherever vice was to be found in its vilest form. Often he would persuade the most inveterate gamblers to give up cards and dice, by interesting them in the game of chess, which he would explain to them.

"You, my friends," said he to a band of soldiers who had hidden their cards at his approach, "belong to no religious order, nor can you pass whole days in devotion. Amuse yourselves. To you it is not forbidden, if you neither cheat, quarrel, nor swear when you play." Then good-humoredly sitting down in the midst of them, he challenged one of the party to a game of chess, and was found at the board by Don Diego Noragua, whose curiosity had brought him from far to see so holy a man, and to catch some fragments of that solemn discourse which must ever be flowing from his lips. The grandee would have died in the belief that the saint was a hypocrite, were it not for his chancing afterward to break in upon his retirement, and finding him so earnest at his devotions.

SANS VOIR.

THE practice of playing blindfold is coming much into vogue, and we see a spirit of rivalry is being excited between Messrs. Blackburne, Zuckertort, and Rosenthal, who have emulated the wonderful feats of Morphy and Paulsen in conducting from ten to fifteen games simultaneously.

It is no new art, however, having been practiced as early as the tenth century. We find mention made of a player at Tripoli, in Syria, in the year 970, who was famed for playing without seeing the chess board.

Harwitz, in recommending blindfold play, says: "It is an improving practice to obtain the power of playing over games a second time from memory. It enables you also to record any game which you deem worthy of the honor."

The following odd little blindfold game was played over twenty years ago, and was the first game of the kind we ever attempted. The termination is very pretty:

S. LOYD. WHITE.	I. S. LOYD. BLACK.
1. P to K 4	1. P to K 4
2. K Kt to K B 3	2. Q Kt to Q B 3
3. P to Q 4	3. Kt x P
4. Kt x P	4. Kt to K 3
5. K B to Q B 4	5. P to Q B 3
6. Castles.	6. K Kt to K B 3
7. Q to K B 3	7. K B to Q 3
8. K Kt to Q 3	8. Kt to Q 5
9. Q to Q sq	9. Kt x P
10. R to K sq	10. B x R P ch
11. K x B	11. Q to K R 5 ch
12. K to Kt sq	12. Castles.
13. P to Q B 3	13. P to Q 4
14. B x P	14. Q B to K Kt 5
15. Q to Q R 4, and white mates in four moves.	

W. GRIMSHAW, OF ENGLAND.

DANBURY NEWS TOURNEY.

PREVIOUS to closing his engagement with the *Danbury News* Mr. Neill offered two prizes for the *best* and most *brilliant* games. In SUPPLEMENT No. 99 we made allusion to this interesting tournament, and were so fortunate as to select the game which received the prize for brilliancy of play. We now present to our readers the game which received the prize for the *best* play, both of which, it will be seen, were won by Mr. Reichhelm, of Philadelphia:

Prize bearing *best* game in the *Danbury News* Tourney.

MR. REICHHELM. WHITE.	MR. ALBERONI. BLACK.
1. P to K 4	1. P to K 4
2. K Kt to B 3	2. P to Q 3
3. P to Q 4	3. P x P
4. Kt x P	4. K Kt to B 3
5. Q Kt to B 3	5. B to K 2
6. B to Q 3	6. P to Q Kt 3
7. Q to B 3	7. B to Kt 2
8. B to Kt 5 ch	

Commencing an interesting complication.

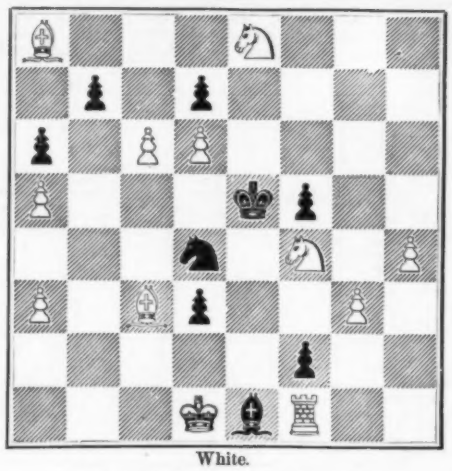
	8. P to B 3
9. P to K 5	9. P x P
10. Kt x P	10. Castles.
11. Kt x Q	11. B x Q
12. Kt x B P	12. R x P
13. R to K Kt sq	13. K x Kt
14. B to B 4 ch	14. K to K sq
15. R x B	15. Q Kt to Q 2
16. R x P	16. R to Q B sq
17. B to Q 3	17. Kt to B 4
18. B to Kt 5 ch	18. K to Q sq
19. B to Kt 5	19. Kt to K 3
20. Castles, ch	20. Kt to Q 5
21. P to B 4	

The *coup de grace* forcing the game, after which black resigned.

PROBLEM No. 93. BY W. H. ATKINS.

Prize Set of the Onondaga Tournament of 1858.

Black.



White.

White to play and mate in five moves.

SOLUTIONS TO PROBLEMS.

No. 86.—BY MISS M. RUDGE.

WHITE.	BLACK.
1. B to Kt 5 ch	1. K x B
2. Kt to Q B 7 ch	2. Kt x Kt
3. P to B 4 ch	3. K x P
4. Kt to B 3 mate.	
	1. K to Kt 3
2. B to K 3 ch	2. K x B
3. Kt to B 7 ch	3. Kt x Kt
4. R to Kt 6 mate.	
	1. K to Q 4
2. Kt to B 5 ch	2. B to Q 6
3. R to Q sq ch	3. Kt x R
4. Kt to B 6 mate.	

No. 87.—BY W. A. SHINKMAN.

WHITE.	BLACK.
1. R to K R 7	1. K x P
2. P to Q 7	2. K to Q 3
3. P knights	3. K to Q 4
4. R to Q 7 mate.	
	2. K to K or B 3
3. P becomes R	3. K moves
4. R to Q 6 mate.	

LETTER "H."—ASSOCIATION LETTER TOURNEY

WHITE.	BLACK.
1. Kt to Q 5 ch	1. K x P
2. Kt to Q 6 ch	2. K to K 4
3. P x Kt mate.	
	1. K to Kt 4
2. R x Kt ch	2. K to R 4
3. P to Kt 4 mate.	

ENIGMA No. 54.—BY C. H. GILBERG.

WHITE.	BLACK.
1. Kt to B 8	1. K x R
2. Kt to K 6 ch	2. K to Kt 3
3. B to B 7 mate.	

THE ONONDAGA PROBLEM TOURNAMENT.

DURING the summer of 1858, Mr. W. O. Fisk offered, through the *Syracuse Standard*, a complete set of Staunton's chess works for the best set of two problems, received prior to Oct. 1 of that year.

The committee of award consisted of G. N. Cheney, Samuel Loyd and John Gardner, who mention in their report that "Twenty-two problems were entered, nineteen of which were correct and very pretty, original, and all well worthy of honorable mention."

The prize was awarded to W. H. Atkins of Syracuse, whose problems appear in this issue, but we wish to state that we have grave doubts as to the genuineness of the name. Mr. Atkins we were informed had hitherto contributed his problems under the assumed name of H. S. Lover (*a chess lover*), but a search through the pages of the *Chess Nuts* fails to find either of these names, nor have we yet discovered the true authorship of the problems. Mr. Fisk could doubtless throw some light on the subject.

IN reply to several correspondents we would state that Caissa is the name of the heroine in Sir William Jones' poem, and has since been regarded as the muse or goddess of chess:

"O'er hills and valleys was her beauty famed,
And fair Caissa was the damsel named."

This poem is often referred to, and has been accorded an undue prominence. It was written by Sir William Jones when he was but sixteen years of age, and we are of the opinion that it would have been better for the chess world if he had suppressed it when he came to years of discretion.

MESSRS. REICHHELM, Elson, and Neill of Philadelphia have been selected as the Committee of Award in the American Chess and Problem Association Tournament. The problems are now in their hands, and we are promised to have the verdict in time for our next issue.

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